DECEMBER 5, 1955

NEWS ISSUE

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

How the Engineer Can Help the Buyer and the Storekeeper

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Fluid Coke Shows Promise . . . Page 22

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E B POWER
UNIVERSITY MICROFILMS
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ANN ARBOR MICH

PRODUCTIVITY FORUMS, organized in cooperation with utilities to stimulate new applications of electricity in industry, continue to be held throughout the country. Pictured here at a forum in Rochester are A. M. Beebee, President of Rochester Gas & Electric Corporation (standing); G.E.'s Horace Zimmer (left); G-E Commercial Vice President Harold Olson; and W. G. McKie of R. G. & E.

MPA TRAINING PROGRAMS cover everything from motor selection and application to electric heating and electronics to help electric utilities step up extensive industrial electrification.

10th YEAR OF **MORE POWER TO AMERICA PROGRAMS SIGNALS**

New stimulants for electric power markets

LOAD MAGAZINE continues to provide a constant stream of stimulating and practical ideas to the electric utility industry.

Full-scale load-building promotions made by the electric utility industry in the past decade have helped cultivate a tremendous array of new markets for electric power. More important, significant contributions were made to improving the nation's standard of living.

Among the tools used in achieving this progress were utility executive conferences, More Power to America Awards, *Load* magazine, industrial productivity forums, exhibits, space advertising and sales promotion, market development and sale training films and film programs.

At the ten-year milestone for "More Power to America," General Electric joins utilities in a look at the "Golden Decade" on the horizon. The phenomenal growth potentials are a tribute to the energies of the industry and a challenge for even more intensive promotion work.

Continued development of old and new markets for electric power should bring about realization of the trillion kilowatt-hours forecast for 1965. We at General Electric hope that the More Power to America programs in the offing will help the industry reach—and exceed—its goals. General Electric Co., Schenectady 5, N. Y. 301-301

MILLIONS OF AMERICANS saw G.E.'s More Power to America Special which demonstrated why electricity costs so little.

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Electrical World

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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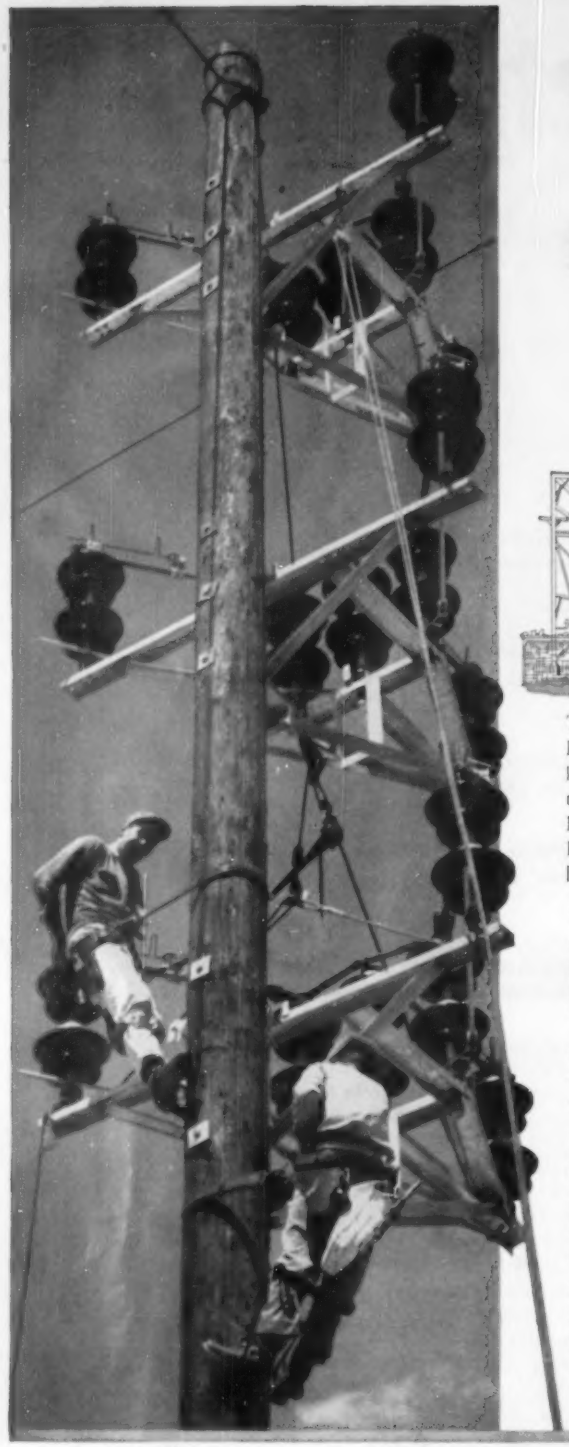
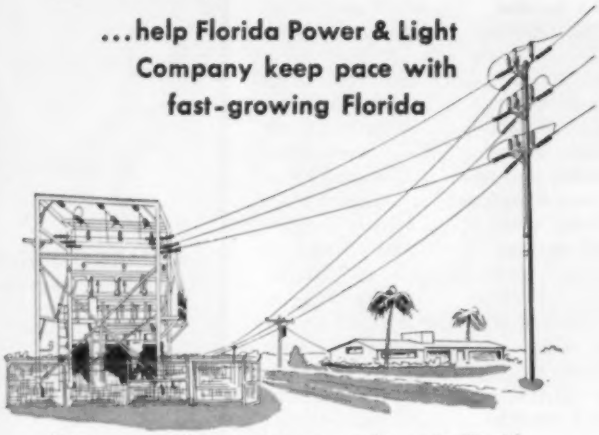
COMING NEXT WEEK—In keeping with its prestige as the leading source of industry technical information, Electrical World will present a collection of seven articles.



GOABS* go up fast, save space, cut costs and give dependable service

...help Florida Power & Light Company keep pace with fast-growing Florida



To meet rapidly growing power demands, Florida Power and Light Company, largest utility in the state, has increased its electric power facilities more than three times in the past ten years, adding 13 new generators. Before 1956 is over, another 80,000 KW will be added. Plans call for a total of 1,122,000 KW to be available by mid 1957.

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You can get GOABS for 1-way, 2-way or 3-way switching in 600 amperes, 15, 23, 34.5, 46 and 69 KV ratings. Bulletin 601-A gives complete information.

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CS55-15

What It Takes to Win

Against long odds Washington Water Power Co racked up an impressive victory in the election battle involving the future of the Stevens County (Wash.) Public Utility District (see p 8). Under the forceful leadership of Pres Kinsey Robinson, the privately owned Washington utility gained more than 70% of the votes in the all-or-nothing contest as to whether it or the PUD would serve Stevens County. Under state law the company needed 60% of the votes to win.

Washington State's formidable public power bloc threw all its weight into the battle which was the first opportunity given PUD customers to vote for service by an electric company. The manager of the state-wide PUD association, a citizens committee, and leadership of the Grange all took the stump in an effort to keep the PUD in business.

Close observers of the Nov. 22 election believed the electric company victory turned on three main issues:

1. Service by WWP would mean an annual gain for the county of $25,000 in taxes.

2. There is no provision for regulation of PUD rates.

3. PUD service had been generally poor.

Although PUD rates in the county averaged about 53% higher than company rates, this was believed to have counted little in the election results. Reason was the PUD had promised to match Washington Water Power rates if it gained control of electric service in the county.

We venture the guess that other factors played a large role in the impressive victory.

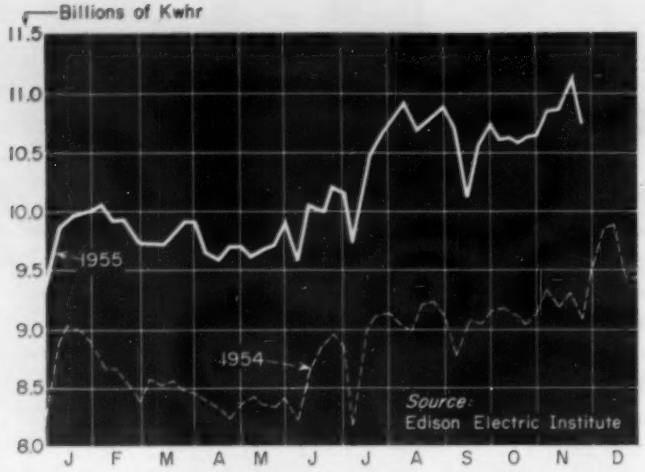
One of these was the determination and experience of Robinson, the hard-hitting, straight-talking former lineman who rose to become utility president. Probably no man in the industry feels so strongly that private enterprise is best equipped to serve the public with electric power. Certainly no man is more ready to do battle for this belief.

Just a few years ago Robinson, fighting against his own boss, snatched his company from the very jaws of public power. He has spent considerable time and effort in trying to save other companies in his area from succumbing to public power. These fights have given Robinson the experience that came in handy in the Stevens County battle.

Another important factor in the victory was the all-out campaigning effort of WWP employees. These men and women did the door-to-door campaigning and built the friendships that turned the tide. An organization of that kind of people, convinced and determined, is hard to beat in any kind of election. Much credit goes to the "Stevens County Power Vote Committee," headed by Ernie Sackman, which campaigned for sale of the PUD facilities.

Still another factor contributing to the WWP victory is the beginning of a trend of public reluctance toward public spending. This trend was apparent in the elections earlier in November when a number of resolutions involving public spending for highways, water supplies, and other purposes were disapproved by the voters. This trend was vaguely sensed by the chairman of the Stevens County PUD, Joe Garvey, who summed up the results in these two curt, yet meaningful, sentences:

"Apparently we took quite a trouncing here. Evidently it might be called a trend."



OUTPUT

Week Ended Nov. 26
10,727,000,000 Kwhr
Up 18.0%

Atomic Energy Commission requirements — 1,081,000,000, kwhr (Electrical World estimate). Excluding AEC, output increase was 12.6%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Nov. 26	+18.0	+11.4	+9.2	+27.3	+10.4	+18.3	+15.7	+16.4	+25.2	+15.0
Nov. 19	+19.7	+10.9	+10.3	+28.9	+14.2	+19.8	+16.0	+18.4	+29.1	+16.5
Nov. 12	+18.3	+10.6	+9.9	+30.3	+12.4	+20.2	+13.7	+15.6	+13.8	+12.4

Seasonally Adjusted Index 211.5 Week Ago 210.7 Year Ago 177.3

Issue's Highlights—Stevens County, Wash., voters by 72% majority favor PUD selling facilities to Washington WP . . . Middle South Utilities Pres Edgar H. Dixon will seek court ruling on AEC's refusal to pay cancellation fees for Dixon-Yates contract which AEC says may not be valid . . . Memphis contracts with Westinghouse for three generators for proposed city power plant . . . Harriman scores private power in NW . . . Paul B. McKee lauds private power in NW . . . Installed generating capacity hits record high.

Congratulations—American & Foreign Power has elected following executive vice presidents: Henry W. Balgooyen, in charge of economic development; Grant O. Hylander, administrative assistant to president; Myron Reed, in charge of operations and engineering; and William B. Stafford, in charge of financial and accounting matters. Following have been made vice presidents: Claire Titus, employee relations, rates, and research; Don G. Lewis, in charge of Cuba and Mexico properties.

More Personnel Changes—Effective Jan. 1, president of Brockton (Mass.) Edison will be Louis F. Eaton, operating vice president. He will succeed Walter A. Forbush who will continue as director and chairman of executive committee. Paul E. Milstead, chief engineer of Tampa Electric, joins Brockton Edison as vice president Dec. 15 . . . Southern California Edison has named George N. Hawley vice president and assistant to the president; given Vice Pres John H. Mead direction of commercial department; named Joseph R. Brookshire, assistant vice president in charge of public and community relations.

Service Entrance Change—West Penn Power will raise minimum service entrance requirement from 70 to 100 amps, effective Jan. 1. This requirement will apply to both conductors and entrance equipment and be applicable in all individual installations having more than one branch circuit.

Rate Increases—Over $25.3 million in known electric rate increases was granted to 19 companies in 11 months of 1955, according to EW study. But in all, 25 companies received 29 increases in 16 states and District of Columbia . . . Cape & Vineyard Electric has asked Massachusetts commission for $305,000 a year increase.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Group of ten petitioners has asked Federal Court of Appeals to annul FPC's license to Idaho Power to build Hells Canyon dams . . . President's Committee on Water Resources & Power is recommending greatly stepped-up Eastern flood control program . . . Dr Charles D. Luke, formerly classification director, has been named AEC's technical assistant to the director of civilian application for hazard evaluation . . . Recent AEC-industry talks on atomic regulations agreed that licenses for fuel fabrication facilities may be unnecessary; that standardization of state radiation codes should be pressed; that review of safety features in reactor applications should be routine job for central staff.

Farm Power Use—American farmers are expected to buy $24 billion dollars worth of electrical appliances and equipment between 1956 and 1975, according to rural market study just completed by REA. This is average of $5,300 per farm. In next five years alone farmers will purchase $5.3 billion of electrical devices, delegates to annual Power Use Work Shop of Inter-Industry Farm Electric Utilization Council were told in St. Louis last week.

Electronic Equipment Study—Cincinnati G&E is engaged in intensive study and planning "to revise our underlying accounting data and to prepare our personnel for latest developments in electronics," company officials told New York Security Analysts last week.

Engineers Reject Union—Engineers at Gulf States Utilities have pulled out of the Gulf States Employees Association (independent union) effective with new contract Nov. 6. New agreement provides for 4% wage increase with wage reopening after one year . . . Westinghouse strike deadlock continues as unions reject company proposal to resume work while negotiations are underway.

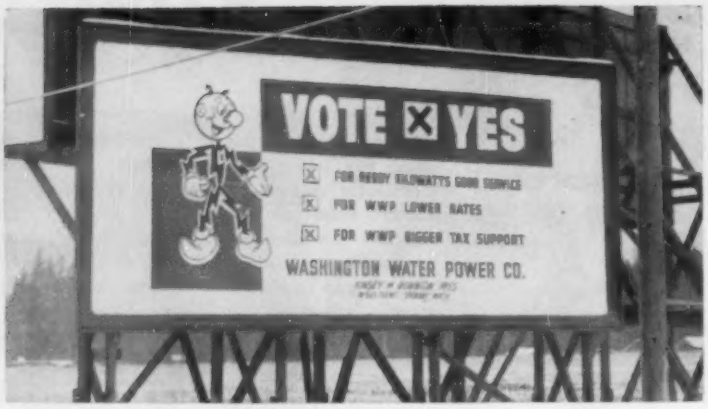
Expansion plans—Puget Sound P&L will begin immediate enlargement of Snoqualmie Falls hydro plant from 22,000 to 42,000 kw under $3 million program. Decision follows withdrawal of condemnation proceedings against plant by City of Renton. Puget already has placed hydraulic turbine contract with S. Morgan Smith Co. Morgan Smith in last few weeks has received over $2.7 million in hydraulic turbine orders. Other firms who ordered, in addition to Puget, are Portland GE and Montana Power.

ABOUT PEOPLE IN THE INDUSTRY

TVA, to meet 12% per year increase in power requirements (exclusive of national defense loads) in its service area, will need to install 750,000-kw additional generating capacity each year, according to TVA Director Harry A. Curtis. This "means an investment of about $150 million a year—year in and year out. TVA sees little likelihood that this rate of growth will decrease in near future (but) might increase substantially." New power needs are equivalent of one Johnsonville steam plant every year.

Shortages and inadequacies in engineering field, according to Arizona PS Pres Walter Lucking, trace back to lack of emphasis placed on mathematics and physical sciences in grammar and high schools. "This is not the fault of our educational system," he said. "We have a knowledge of courses and facilities necessary, but have not provided an incentive to the teaching profession, nor have we provided the facilities. Last year industry could have used 40,000 engineers against 22,000 who received degrees."

More News About People page 39



Kinsey Robinson campaigned for his utility with speeches and billboards to help . . .

Voters Choose WWP 5-2 Over PUD

- **72% majority in Stevens County, Wash., decides PUD will sell out to WWP**
- **Record turn-out to polls in first such election since PUD's established**
- **WWP Pres Kinsey Robinson hails result as "victory for private enterprise"**

For the first time voters recently were given an opportunity to choose between a public utility district and a private utility. The utility, Washington Water Power Co, won with a whopping 72% majority.

Scene of the unprecedented election was Stevens County, a farming and mining region in northeastern Washington, where more voters turned out on the power issue than had balloted in the last presidential election. Final count was 5,009 for WWP; 2,028 for PUD.

WWP Pres Kinsey M. Robinson called the election result a "victory for private enterprise." There could be little doubt that the Stevens County vote would be interpreted widely as a grassroots mandate in the long struggle between public and private power in the Pacific Northwest.

The immediate result of the WWP victory meant that the company would acquire PUD facilities for $2.9 million in a matter of days, and the PUD had agreed to attempt no condemnation for at least five years. The price on its properties enabled the PUD to pay all its obligations and deposit $200,000 extra in the bank for possible future activities.

Had WWP failed to win at least 60% of the vote, it had agreed to withdraw from the county and sell its properties to the PUD for $3.1 million. The properties included the 1,600-kw Meyers Falls generating plant, 150 mi of high transmission line, and a network of distribution lines.

Robinson estimated the WWP victory would mean a saving in rates to former PUD customers of $105,000 a year. He indicated the WWP plans an extensive campaign to "build a load in the county." During 1954, WWP customers in Stevens County had used an average of 5,938 kwhr compared to the PUD average per customer of 4,042 kwhr.

Since Washington State legalized public utility districts and gave them broad condemnation powers in 1930, Washington Water Power has lost properties in Chelan, Douglas, Ferry, Okanogan, and Pend Oreille Counties to PUD's.

The struggle for Stevens County's sprawling electric system began in 1929, when American Power & Light Co, a holding company, bought up the stock of the old Stevens County Power & Light Co, and turned its operation over to WWP. Two years later WWP acquired the Stevens stock. In those depression years, line extensions were few.

It was not until 1937 that most of Stevens County got power through a 1,200-mi distribution system built under Rural Electrification Administration and serving primarily rural areas. In the hope of consolidating the county's electric systems, the citizens voted to establish a public utility district, and in 1948, the district brought condemnation proceedings against WWP.

A jury valued WWP properties in the county at the time at $2.5 million. The PUD was unable to raise the money. So it turned to the other

Bennion Hails Vote

Col H. S. Bennion, managing director of Edison Electric Institute, hailed the Stevens County vote in favor of Washington Water Power Co (above) as nationally significant.

Outcome of the election, he said, was an indication that President Eisenhower's partnership policy has hit home in the Pacific Northwest where public power is so well entrenched.

"In that country were we have so much public ownership," Bennion said, "people are beginning to see the advantages of free enterprise." He also stated that people in the region were beginning to "see through the fallacies of public power" and that taxpayers everywhere were tiring of financing public-power in regions remote from their own homes.

system and in 1952 took over the REA. To get capital the PUD refinanced the REA system, almost doubling interest on indebtedness.

Under leadership of a retired insurance bonding inspector, Jean L. Charbonnel of Colville, a group of citizens formed a committee to rid the county of the PUD and what they called a "perpetual debt." Just when Washington Water Power joined the movement, and to what extent, is not clear, but the company's 1954 financial report shows it spent $1,750 to print 5,000 copies of a pamphlet by Charbonnel attacking the financial practices of the PUD.

Right to Vote on Issue Won

Physically unable to undertake a long campaign, Charbonnel relinquished direction of his committee to a youthful rancher, Ernest H. Sackman. Reorganized as the Citizens' Power Vote Committee, this group pressed for, and eventually won, an agreement from the three PUD commissioners to put the question of WWP or PUD service to the voters.

Once the special election date was set, intensive campaigning began. WWP sent a dozen employees into the county to canvass door-to-door, handing out "Reddy Kilowatt" cookie cutters, earrings, and pamphlets. The 18 Stevens County Granges threw their weight behind the PUD and grange deputies tramped doggedly behind the WWP men, entreating voters to see the issue their way.

Low Rates Campaign for WWP

WWP President Robinson himself addressed mass meetings at Colville and Chewelah the week before the election, and former U. S. Senator C. C. Dill of Washington spoke at meetings on behalf of the PUD. The bitter campaign in some cases broke friendships.

But WWP did not win on electioneering alone. It compared its average rates—1.35¢ per kwhr—to the PUD rates, 2.72¢. Based on current levies, Stevens County stood to gain as much as $25,000 more revenue with WWP serving the entire county than with the PUD in control. Despite the acquisition of most rural lines by the PUD, a few Stevens County farmers still are using oil lamps. After the election, Robinson promised that these "would not have long to wait for electricity."

The polls opened at 8 AM in 64 precincts in Stevens County and by 10 AM it was apparent the vote would be heavy. One man walked four miles to ballot at Loon Lake. By noon, both WWP and the PUD knew which voters had not cast ballots and had sent emissaries to urge these to go to the polls. More than 75% of the county's voters eventually marked ballots, and the result was overwhelming in favor of private power.

On Wednesday morning after the vote, Robinson dispatched Allen Elder, company treasurer, to Colville with a check for the PUD purchase. PUD President Joseph Garvey said the commissioners would meet before the end of November to turn over their properties to WWP.

For the first time, in a clearcut election where the only issue was private or public power, the voters of a county got their chance to say what they wanted. The result: 72% in favor of private power. This, in a farming area where, in the words of Washington State Grange Master A. Lars Nelson, the "prestige of the Grange and public power were on the line."

Dixon-Yates Threatens Suit

. . . to collect cancellation fees which AEC refuses to pay on grounds that contract's legality in doubt because of Wenzell

The Dixon-Yates contract seemed headed for the courts last week, one way or another.

The Atomic Energy Commission questioned the legality of the contract and said it would not pay penalties for cancellation. The Dixon-Yates group promptly announced that they would sue to collect about $3 million invested in the $107-million plant site before the Administration cancelled the contract.

Congressional Democrats continued their probe of circumstances surrounding the contract's negotiations. Sen Estes Kefauver (D-Tenn.) predicted possible disclosure of a "criminal conspiracy involving a number of high-ranking persons."

AEC Follows Legal Staff Brief

AEC's decision to renege on cancellation payments came when General Counsel William Mitchell adopted and passed on to the Commission the findings and recommendations of his legal staff. AEC lawyers had concluded that the dual role of Adolphe H. Wenzell, Budget Bureau consultant and senior vice president of First Boston Corp, constituted a violation of the so-called conflict-of-interests law.

Wenzell advised the Budget Bureau and Edgar Dixon, president of Mississippi Valley Generating Co, the Dixon-Yates firm, during pre-contract talks in Washington and New York during early 1954. The firm he represented later became the agent for arranging the Dixon-Yates financing.

Citing statutes, court decisions, and opinions of the U. S. Attorney General, Mitchell told the five AEC commissioners that, because of Wenzell's participation in the talks leading up to the contract, "There is a substantial question as to the validity of the contract which can only be settled in the courts." He said violation of the government's rules in connection with the inception, negotiation, or execution of a contract may make the contract invalid.

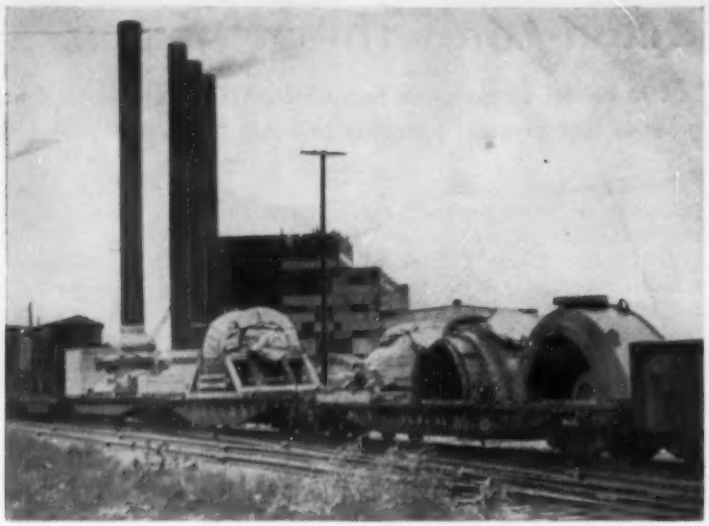
Ike Orders Ethical Standards

From Gettysburg, Pa., President Eisenhower issued an order directing unpaid government consultants, such as Wenzell, to "abide by the same high standards of ethical conduct which are demanded of all government officials."

Mitchell was careful to limit his findings to the civil aspects of the case.

Kefauver, on the other hand, hailed what he called the "final rejection" of the contract and promised exploration of the "criminal side" of the case. He said before his investigating Senate subcommittee is through "we may find a case of criminal conspiracy involving a number of high-ranking persons."

Kefauver planned to call in for questioning Roland Hughes, Budget Bureau director; Lewis Strauss, AEC chairman; Ralph Demmler, former Securities & Exchange Commission chairman; and Justice Department representatives.



CEI's Eastlake Gets Big GE Shipment

Cleveland Electric Illuminating Co's Eastlake Plant recently received General Electric Co's largest private shipment since 1924 in number of railroad cars (see above). The plant is located in Lake County on Lake Erie.

Loaded on ten cars were parts needed to begin assembling a 240,000-kw generator, fourth unit at the Eastlake Plant. The super-shipment weighed over 270 tons and was valued at about $1 million.

Memphis Plant Contract Awarded to Westinghouse

A $17-million contract for three generators to be used in Memphis' proposed 600,000-kw power plant has been awarded to Westinghouse Electric Corp by Memphis Light, Gas & Water Commission.

The exact amount of the contract is $16,988,700 and is for the purchase of three 200,000-kw generators, Ray Morton, vice president of the commission, has announced.

Along with the contract, the commission has an option to change its order to 250,000-kw units costing $20,540,580 if it should be decided within the next three months that the larger units are needed.

Award of the contract, at a special meeting of the commission, was made to the company submitting the lowest proposal among bids opened Oct. 20. Other bids were submitted by Allis-Chalmers Manufacturing Co and General Electric Co.

Morton said the Westinghouse contract was awarded subject to the sale of revenue bonds to finance the entire power project which is expected to cost about $105 million.

One of the major obstacles now in the planning phases of the new plant is a site location. Morton said the site selected will affect the total cost of the plant and that no bonds can be sold until the location and full cost are determined.

FPC Okays NW Pipeline To Import Canadian Gas

Natural gas is getting a new market —the Pacific Northwest. The Federal Power Commission has approved the first pipe line to import gas into the United States.

Pacific Northwest Pipeline Corp will build 955 mi of line at a cost of $28,549,456. The expansion will double the firm's capacity and enable it to supply more gas throughout the northwestern states.

FPC had already authorized Pacific Northwest to transport gas from New Mexico and Colorado to market areas in Utah, Wyoming, Idaho, Oregon, and Washington. This pipe line is under construction now. Industrial users are expected to be the first customers for the Canadian gas.

SEC Approves Financing of Yankee Atomic Plant

The Securities and Exchange Commission recently approved the initial financing of Yankee Atomic Electric Co's proposed atomic power plant in Massachusetts. Two of the 12 sponsoring utilities have also been granted special exemption by SEC to prevent them from being classified as holding companies as a result of their sponsorship.

Although Atomic Energy Commission rejected the first Yankee plan, the company has submitted a new proposal for the $33.4-million, 134,000-kw plant. Initial financing, which would cover preliminary costs of the plant, includes issuance of $500,000 in capital stock and $500,000 in unsecured, non-interest-bearing promissory notes to the sponsoring companies.

Harriman in NW Scores Republican Power Policy

New York's Gov Averell Harriman, stumping the Northwest like a presidential candidate, hit Milwaukie, Ore., recently to rail against Republican power policy, in general, and private development of Hells Canyon, in particular.

Speaking at a dinner gathering of about 500 in that Portland suburb, the New York governor declared that the Republican party had a "firm and settled policy" to give away the Northwest's natural resources and strangle the West's development.

"It is your good fortune," Harriman said, "to have . . . the massive falling waters of the Columbia (River)—40% of the hydroelectric power potential of the country. . . . The rest of the country should help you develop these resources, just as you have helped the Tennessee Valley, the Missouri Basin, and the St. Lawrence Seaway. And we in New York need your help, too, to prevent a gigantic give-away Republicans are pushing at Niagara Falls."

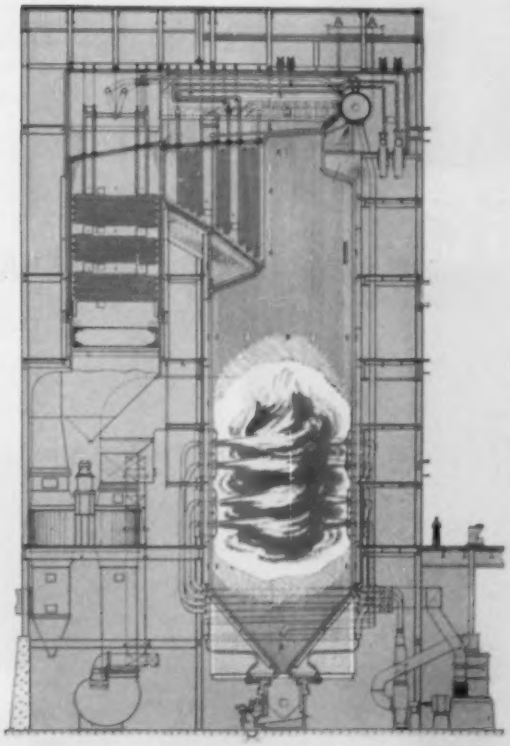
Nothing, the governor said, "so symbolizes the give-away philosophy as the deal at Hells Canyon . . ." permitting Idaho Power Co to develop that stretch of the Snake River.

(For another appraisal of power development in the Pacific Northwest, see page 15 of this issue.)

THE BURNER WITH A BRAIN

Automatically the C-E Vertically-Adjustable, Tangential Burner nozzles tilt downward. More furnace wall surface becomes effective. Gas temperature to superheater is lowered. *Steam temperature comes down.*

Conversely, if steam temperature drops below that most efficient for the turbine, burner nozzles tilt upward, sending hotter gases to the superheater—*automatically.*



RESULT—less need for desuperheating . . . minimum use of spray water . . . less chance of fouling turbine blades. Turbine availability is higher . . . efficiency is maintained.

Modern, high-pressure, high-temperature power generating units need the highest quality steam possible. That's exactly what they get with C-E Tangentially-fired Boilers.

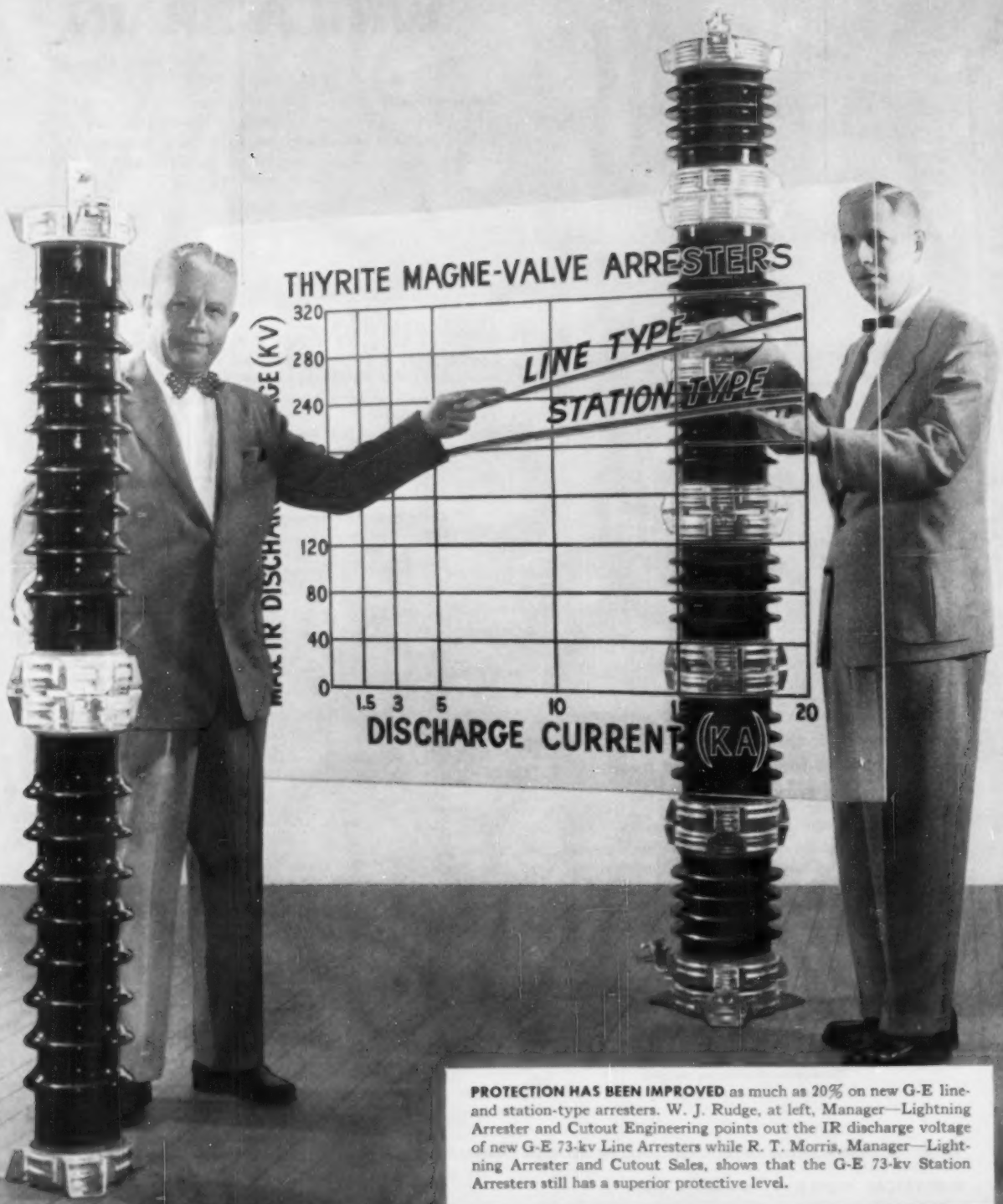
COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

B-821

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

G.E. appraises a tough question on lightning arresters . .



PROTECTION HAS BEEN IMPROVED as much as 20% on new G-E line- and station-type arresters. W. J. Rudge, at left, Manager—Lightning Arrester and Cutout Engineering points out the IR discharge voltage of new G-E 73-kv Line Arresters while R. T. Morris, Manager—Lightning Arrester and Cutout Sales, shows that the G-E 73-kv Station Arresters still has a superior protective level.

. . . . . LINE OR STATION . . . WHICH SHOULD YOU CHOOSE?

Which is better for your application, line or station arresters? Now that General Electric has made major design improvements in both types, the right answer to this question gains new importance.

THE CHOICE IS YOURS. G.E. makes both types. Although there isn't any black-and-white solution that can be applied everywhere, there are some clear-cut applications for each, depending upon the economics and engineering involved.

SUGGESTED APPLICATION GUIDE. To help you strike a balance between the best degree of lightning protection and the lowest possible cost, General Electric makes these suggestions.

G-E Station-type arresters are generally preferred for:

1. Locations where size and importance of apparatus demand the best in protection for uninterrupted service-continuity.
2. Transformers or other apparatus having reduced insulation and rotating a-c machines, 2400 volts and above.
3. High-voltage lines subject to severe switching surges.
4. Cable systems or large KVAR capacitor banks that require maximum arrester discharge capacity.
5. Transformers in severe lightning localities or connected to lines with no overhead ground wire, or highly insulated wood pole lines, or locations where close arrester coupling is not possible.

G-E Line-type arresters are generally preferred for:

1. The protection of smaller or what is considered less important apparatus.
2. Locations where space requirements for station arresters are not available, for example, certain metal-clad equipments and mobile substations.
3. Protection of switching substations containing breakers, air-break switches, etc.
4. Protection of low voltage side of transformer substations, where line-type arresters are already used on high voltage side.

WHICHEVER YOU CHOOSE, line or station, remember that now you get as much as ***20% more protection*** in both types. The reason—a design combination of improved Thyrite valve disks and exclusive Magne-Valve series-gap.

NEED MORE HELP? The data chart below shows you the comparative characteristics of G.E.'s new station-type and line-type arresters. An application engineer from your local G-E Sales Office will be glad to assist you. Or write to General Electric Company, Schenectady 5, New York—ask for Bulletin GEA-1304 (Station Arresters) or Bulletin GEA-2978 (Line Arresters).

452-14

COMPARATIVE DATA

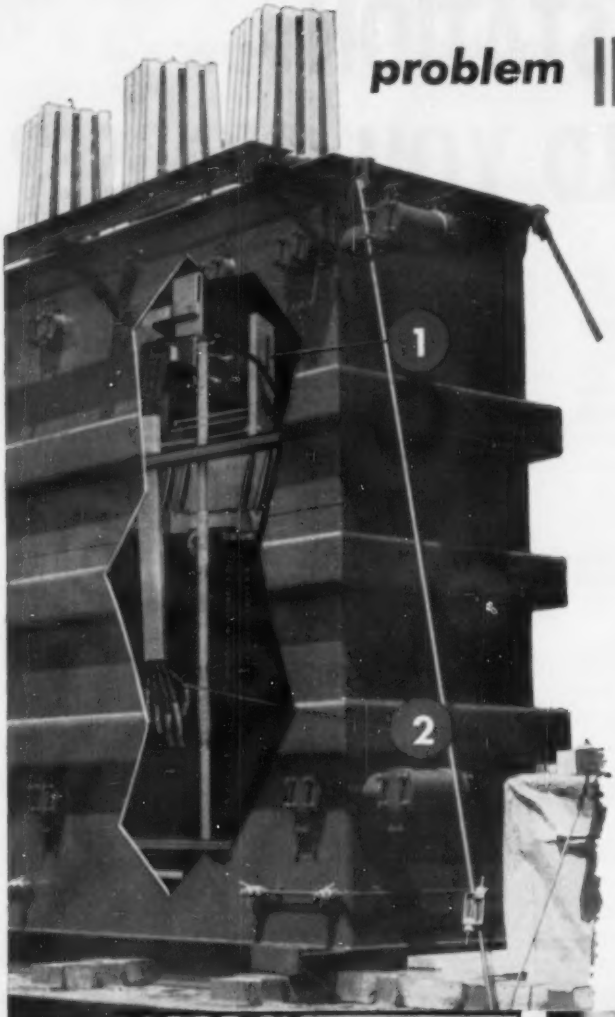
THYRITE® MAGNE-VALVE	STATION-TYPE	LINE-TYPE
DISCHARGE CAPACITY		
HIGH CURRENT — 5 X 10 μs wave, 2 discharges	150,000 A	100,000 A
LONG DURATION — 2000 μs rectangular wave, 20 discharges	650 A	200 A
DUTY CYCLE — (10 X 20 μs wave initiating impulses, 20 operations, full rated voltage during flow of follow current)	20,000 A	10,000 A
RELATIVE VOLTAGE STRESS ON PROTECTED APPARATUS	100%	120%*

*(Average—Exact Ratio Depends on Discharge Current) ® Registered Trade-mark G.E. Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

How the solving of a shipping problem IMPROVED THE KUHLMAN TRANSFORMER

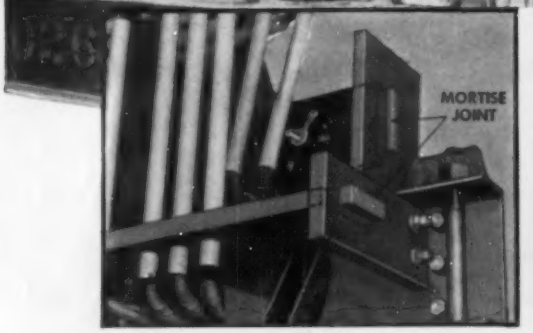


It started as a simple problem:

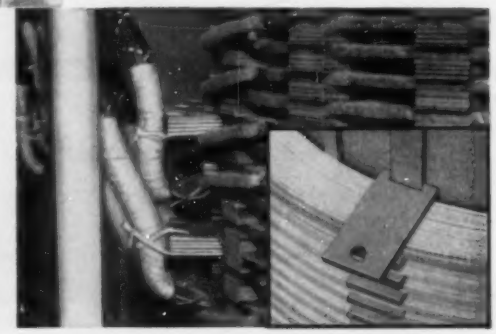
Kuhlman engineers wished to insure Kuhlman power transformers against damage in shipment to the lead guides, terminal boards, and tap changer mountings. They solved the problem, and the happy result is that the new improved Kuhlman power transformers are stronger, better units not only for shipping, but also for moving, installing, and for all-around reliability on the job. The facts are these: usually the construction joints near high voltage terminals are secured by fibre bolts; but the Kuhlman engineers supplanted these with mortise and tenon joints which are substantially firmer and which further produce a more compact arrangement of the terminal structure.

Kuhlman engineers also designed new tap lead supports. These supports, formed by extending the coil spacer nearest each tap lead connection, are anchored between coil sections by a "T"-shaped key on the coil insulation barrier. The tap leads are thus braced by the solid rigidity of the whole coil structure. This eliminates any possible shifting either from shipping vibrations or from operating stresses.

Thus the net result was not only to solve the problem in shipping but to bring about further improvements in the entire Kuhlman power transformer units.



1. Structural insulation with mortise and tenon joints.



2. Tap leads anchored to tap lead supports

Tap lead supports keyed to coil barrier

KUHLMAN ELECTRIC COMPANY 172

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

Private Power Role in NW Praised

- **Paul McKee stumps PP&L's service centers with sober, factual appraisal**
- **Roles of local, private groups compared with that of federal government**

To point up the important role played by private utilities in developing Pacific Northwest power, Paul B. McKee, president of Pacific Power & Light Co, is personally presenting facts and figures on platforms in his company's principal service centers.

Some of his major points are these:

- In the past ten years, local enterprises have installed 2.4-million kw of capacity (in the Pacific Northwest). The federal government has installed about 3-million kw.
- About half the total capacity of the Northwest power pool has been installed by local agencies.
- Customers on privately owned utility company systems total 1,077,000 while only 661,000 are served by public ownership groups.

NW Pool Requires Cooperation

With his direct approach, McKee has squared away at claims that low-cost federal generation has been responsible for declining power rates in the Pacific Northwest since the 1930's and for industrial expansion enjoyed.

At a recent Portland, Ore., Chamber of Commerce forum, McKee stood before a wall-high map of the four-state area. He pointed to major transmission lines linking the load center for 1.7 million customers served by a network capable of handling 8-million kw of energy.

At this point he emphasized that the fame and success of the Northwest power pool rests on the voluntary cooperation of all systems.

Then, illustrating his talk with charts, McKee traced power progress in the region.

"In 1930," he said, "we had about 1-million kw of capacity (the U. S. then had about 1.5-million kw total). . . . In 1940, the Northwest had perhaps 2-million kw and about that time the federal projects (Bonneville Power Administration) began . . . so by 1945 we boasted about 2-million kw locally owned generation and 1-million kw U. S. capacity.

"By 1950 local generation was 3-million kw and U. S. plants totaled 2-million kw. And so we come to 1955, when we have connected to this great pool more than 8-million kw . . . about half installed by local agencies.

"Local agencies—private investor companies and public agencies—have spent $1.6 billion providing the area with power facilities with total generation of 4.3-million kw. The federal government, which of course started a little later, has spent $1.5 billion and has created 4.15-million kw.

"It has been said that it was only when the federal power development came in that we in this region began to be big users of electricity:

Tracing Region's Power History

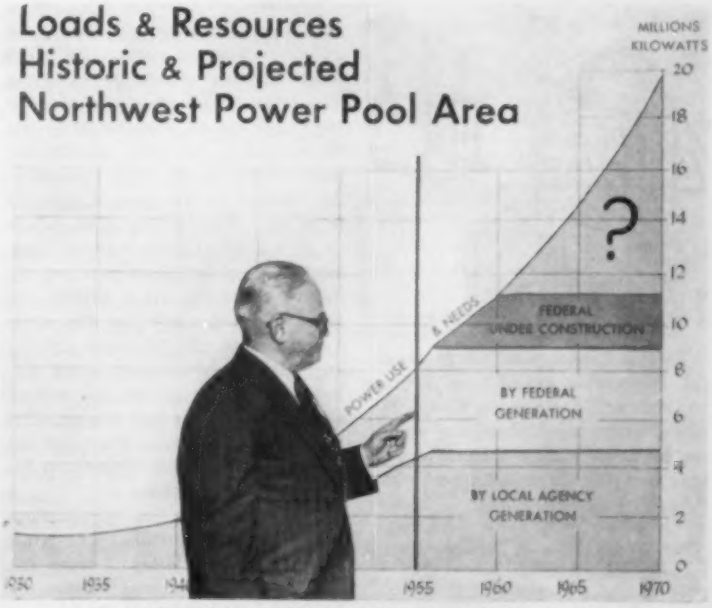
"In 1930 the national average was only about half of our (PP&L's) average residential use. In 1933 it was the same and in 1938 the same. In 1943, when the federal government plants began coming, the ratio still remained approximately the same and today we maintain this fine relationship in comparison with the national average.

"During the same period . . . the cost to the residential user on PP&L system has declined from 3 cents per kwhr to about 1.3 cents per kwhr, and the national average has come down from 6 cents to 2.67 cents per kwhr. . . . I don't think it took government-subsidized power to cause our customers to continue the relative position they have had with the national average right along. For many years we have been blessed here with electricity that can be produced on an economic basis from hydro power, whether by government or private individuals."

Low-Cost Power Lures Industry?

Answering those who claim that federal low-cost energy is the principal lure for new industry, McKee declared, "This idea that the only way we are going to get industry here is to have government-subsidized power is a fallacy."

Other than aluminum reduction, where 13.6% of the cost of production is electricity, the cost of power is only about .59% of the total cost of business, McKee pointed out. Therefore, the utility president continued, business usually gives more weight to raw materials, markets, transportation, climate, and labor supply in seeking a place to locate.



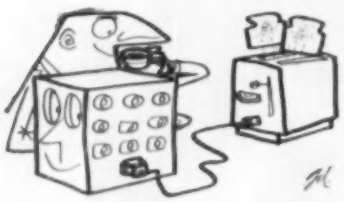
PAUL McKEE TRACES LOCAL, FEDERAL DEVELOPMENT OF POWER

How the Engineer Can Help

W. H. JONES, Manager, Purchasing and Service Operations, Philadelphia Electric Co, Philadelphia, Pa.

[Editors Note: Author Jones speaks from experience when he tells engineers how they can help buyers and storekeepers. Now Philadelphia Electric's top buyer, his background includes many years in operations and design. Here is what he told his former engineering and operating colleagues about working together at EEI's T&D committee meeting at New Orleans, Sept. 29].

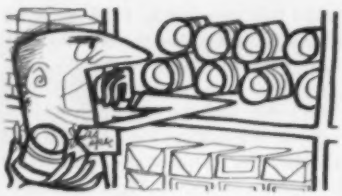
The over-all objectives of buyers, storekeepers, and engineers are the same; namely, to render the best possible service for the lowest possible cost to our customers. With the industry's tremendous expansion it is and will continue to be a real problem to keep the investment per dollar of revenue within bounds. How then can the engineer help the buyer purchase material and equipment so that the company receives the best over-all value from all standpoints (quality, price, delivery, reliability, service, etc)? Here are eleven rules to follow:



1. Don't over-engineer.

By this I mean that, where practical, engineering should have realistic and reasonable tolerances. Giving the manufacturer some leeway may permit the buyer to effect a substantial cost reduction with the manufacturer.

2. Don't specify material only slightly different from that already in stock.



With a little leeway on the part of engineering or operating, in a great many cases the stock material will do the job. This avoids the purchase of a new item, new code numbers, etc, and the buyer avoids a small purchase and is given the advantage of a larger volume purchase of the stock item. In our own company we recently reviewed our wood pole situation and reduced the number of codes from over 300 to 18. Needless to say, that's of tremendous benefit to both stores and purchasing and it took real co-operation on the part of engineering and operating to accomplish that result.

3. Do write spec's so they can be met by more than one supplier.

Certainly the responsibility of a purchasing department is to buy at low price, and real competition is the most effective means of achieving this result. With only one supplier the buyer has no opportunity to test the market to determine whether the price quoted is the best obtainable. An example in this general category is in the street lighting field. Many of us are using mercury vapor lighting. Each of the manufactutrers on our approved list has a slightly different lighting curve for the same lumen output. If the street lighting engineer recognizes that small difference and designs the job around one manufacturer's unit, you see what happens to purchasing. The buyer has lost the advantage of competition for that particular purchase.

Along this same line, specifications and requisitions should, where possible, avoid brand names. I know this is difficult because brand names are in many cases part of the general vocabulary of our construction men and linemen. In those cases where it is necessary to use a brand name for proper identification and description of the article wanted, at least the words "or equivalent" should be used. To cover this general problem a Standardization Committee with real authority to police new items of material and equipment can be of great assistance to both buyer and engineer.

4. Do allow the buyer to make the final buying decision.

There is a natural inclination on the part of everyone "to want to get into the act." However, your company managements have seen fit to set up a specialized department to handle purchasing. Purchasing can only do an effective job if its departmental prerogatives are properly respected and final buying decisions made there. As an example, advance commitments by engineering to a manufacturer or supplier should be avoided wherever possible. Where it can be anticipated that such a situation will develop, it is always helpful to notify the buyer in advance so that when the requisition comes to him he will have been forewarned and prepared to go along with the desires of engineering.

There is nothing which bothers a conscientious buyer more than to receive a requisition specifying only one source with every indication that the purchase has already been made before he was brought into the picture. After all, a buyer is only human, and I have seen cases where he has gone to a lot of trouble to develop a competitive source to offset such an arrangement. That, of course,

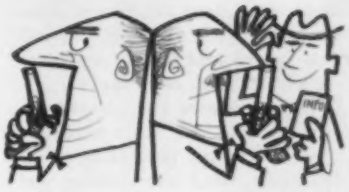
the Buyer and the Storekeeper

is unfair to the manufacturer who may already have done a lot of work on the job and may see someone else get the business simply because engineering and purchasing did not get together at the start of the job.

On the other hand, it is just as important that purchasing leave the engineering decisions to the engineering department. Buyers with engineering training and background can be very helpful in the purchase of some commodities. I believe they can do a better job of analysis and be more helpful in developing new sources if they have engineering training. However, it's possible for an engineer in purchasing to overdo the situation and attempt to do too much engineering along with his buying. This again will probably result in a poorer over-all accomplishment on the part of both the buyer and engineer.

5. Don't overload manufacturers one month—starve them the next.

I believe doing this will result in an over-all benefit to the industry and secondly will generally make the job of the purchasing agent smoother. In so many cases it seems as though we go through a "feast or famine" situation which is certainly not parallel to the way our load growth takes place. In so many cases because of an anticipated shortage of materials, money availability, or a combination of many circumstances, we all seem to jump into the market at the same time. This, of course, overloads the manufacturing facilities of our suppliers, doesn't give the purchasing department time to develop a real competitive situation, and results in higher prices all around.



6. Do give the buyer enough information to allow him to give the vendor fair treatment in case of a controversy between the manufacturer and the company.

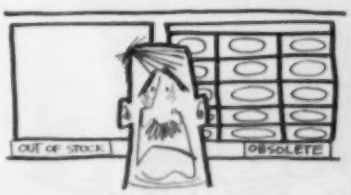
The purchasing agent frequently finds himself in the position of arbitrator between the vendor and his company's engineering or operating departments. His primary interest is, of course, his company. However, he is also very much interested in seeing that the vendor gets a fair deal. You may think that this is an unnatural role for the purchasing agent, popularly thought of as always doing his best to take advantage of the seller. This is not the case. The purchasing agent or buyer is an important cog in his company's public relations program. Not only can he have considerable influence on the general business reputation of his company because of his many contacts and business dealings, but he knows that many of the concerns with which he is doing business are important customers of his own company.

He is also interested in maintaining a healthy business climate with his vendors to keep the competitive situation at a high level. In such cases, therefore, he wants a fair deal for his company, and he wants the vendor to feel that he has received fair treatment. However, in such instances, it is most helpful when he has the full and complete exposition of all the facts from engineering or operating so that he can arrive at a fair decision.

We encourage free discussions between our engineers and our supplier representatives. In many cases we instruct the vendors to contact engineering in order to make sure they have a complete and full understanding of the specifications. After a proposal is received, it is forwarded to engineering with all price information deleted. Engineering then makes a technical analysis and makes its recommendations without being influenced by price. Of course, it is a very happy situation when engineering has recommended the low bid. This frequently does not happen; so then it is necessary for the buyer and engineer to evaluate the bids. You can appreciate that a high degree of buyer-engineer co-operation is necessary in order to achieve the proper result under these circumstances.

7. Don't explain the loss of an order to a vendor—let the buyer do it.

This responsibility should remain with the purchasing department. The vendor is quite anxious to find out why he lost the job so that he will be in position to report to his home office and know what steps to take to be more competitive on the next job. It is an extremely delicate question as to how much information should be given to an unsuccessful vendor and still not divulge information which would be unfair to the winner of the job. Because of this situation, this responsibility should remain with the purchasing department.



8. Do let the storekeeper know about changes in the rate of use.

Now how does the storekeeper fit into this general picture? Of course, if a storeroom could be operated on an ideal basis with requirements, delivery, etc, remaining fairly con-

stant, its operation would be very much of a routine matter. However, as in many other things, nothing is as constant as change, which means there has to be a high degree of cooperation between engineering, operating, purchasing, and stores or difficulties will develop. Rate of use may change, concerning which engineering or operating groups or both have advance information. Delivery times may increase or be reduced, and here the purchasing department should have the most up-to-date information. Prices may be changing, and it may be desirable to place some orders in advance of price increase. This is definitely a purchasing department responsibility.

If stores is not given sufficient advance notice of changes in use or delivery, jobs may be held up because of lack of material; or, conversely, if usage falls off, inventories may become burdensome, costing money and using up space unnecessarily. Or the purchasing department is suddenly faced with a number of emergency requisitions which do not allow sufficient time for proper competitive buying. In order to give your storeroom proper cooperation, as much advance notice as possible of any of these changes should be promptly passed along. Another way in which you can give your storeroom a lift is by using up material on hand when you suddenly decide to change a standard with a large amount of the original material in stock. At least a prompt decision should be made as to whether that material on hand is going to be used, resold if possible, or scrapped. This means that the storekeeper is not faced with the possibility of carrying a double stock of material to serve the same purpose.

9. Do let the storekeeper know what materials are going to be left over from a major construction program.

We are all familiar with the materials left over from a major construction program which we are very anxious to unload on the storeroom upon the completion of the job. This problem can be simplified if the storekeeper is told immediately how much and what materials are going to be left over. He may, in that way, be able to recommend their use in some other department. Possibly the materials can be held for the next construction job, sold, or scrapped.

Well coordinated and realistic delivery schedules are most important to both stores and purchasing. They help stores avoid overstocking and space difficulties or sending to purchasing emergency requisitions which can't be processed properly.

10. Don't use the words "rush at once" or "as soon as possible" unless you really mean it.

The buyer soon gets hardened to them if he finds out they don't mean what they say. As a consequence, real trouble may develop when something is required in a hurry.

11. Do give the storekeeper as much advance notice as possible if you expect to make a sudden change (either way) in your requirements.

You operating men will all agree that your primary concern is getting the job done, whether it be construction or maintenance, and you don't have too much concern about the storeroom or the purchasing department until you suddenly need some material that the storeroom doesn't have. Stores and purchasing are going to get into trouble if you make a sudden change either way in your requirements. As an example, if you suddenly decide to add to your line crews by the employment of contractors, the buyer responsible for contracting the line crews may be completely familiar with what you are doing. However, the buyers of poles, insulators, line hardware, and conductors may be caught short when they get hurry-up calls from the field to replenish these various items. Advance notice to the supervisor of stores will help to avoid much of this trouble.

Of course, there are jobs about which very little can be done. I am thinking for instance of the large commercial or industrial sales job which may require a substantial amount of cable, line wire, poles, and other miscellaneous T&D material, perhaps even a substation. Your sales department will negotiate with the customer over a period of months. You engineers have the job all designed and ready to go. Then, when the sales department finally gets the contract signed on the dotted line, the customer expects construction to start immediately.

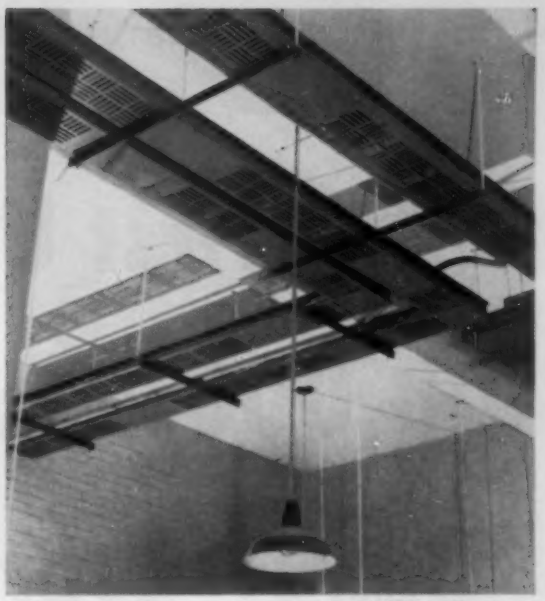
You may say that stores should have been tipped off that this job was in the offing and materials could have been ordered in anticipation of the job's approval. You will find an experienced storekeeper has been burned too many times on that one to go along with it. Too many of these jobs fall by the wayside at the last minute, and the storeroom is left with surplus stock which it may take months to use. There really is only one answer for this problem. Sales can help by advising the customer how much time is needed to secure materials and equipment and to complete construction.

In general, purchasing people must recognize that engineering is chiefly concerned with designing a job that will carry the load but yet not be gold plated. Buyers must recognize the fact that operating people want to get the job done and keep that service on with as few men and manhours as possible.

Engineering and operations must recognize that purchasing is constantly striving to achieve savings yet deliver the goods when needed. They must recognize that stores primary interest is to have the material available when it is required yet keep inventory, personnel, and space minimum.

A proper recognition of all these problems from the stand point of not "what is best for my department" but "what is best for my company" will result in real team work, a smoother, more economical operation.

Sub-stations using Kaiser Aluminum tubular conductor combine efficiency and economy.



Duct systems cost less, are easier to install with Kaiser Aluminum rectangular bar.

For big savings on bus costs . . . think of Kaiser Aluminum

YOU SAVE on material costs when you specify Kaiser Aluminum bus conductors instead of copper for an equivalent installation.

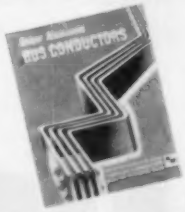
That's because lightweight Kaiser Aluminum not only costs less per pound of material than copper, but takes only one-half the number of pounds for equal conductivity.

In addition, the light weight of Kaiser Aluminum bus makes installation easier, faster, more economical.

On your next bus installation, take advantage of Kaiser Aluminum's unique combination of properties including high conductivity, light weight, corrosion-resistance, workability, strength, and economy. Available in rectangular, solid round and tubular shapes in a wide range of sizes and constructions.

For complete information, contact the Kaiser Aluminum sales office listed in your phone directory, or your nearby Kaiser Aluminum distributor. Kaiser Aluminum & Chemical Sales, Inc. General Sales Office, Palmolive Bldg., Chicago 11, Illinois; Executive Office, Kaiser Bldg., Oakland 12, California.

Joining Kaiser Aluminum bus conductor by welding, brazing, or soldering, can be done easily with suitable equipment and little training. ▶



NEW 12 PAGE BROCHURE FREE UPON REQUEST

Availabilities, properties, advantages and methods of joining and bending aluminum electrical bus conductors are detailed in this new 12 page brochure. For your free copy, please mail the coupon at right.

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Super power transformers pace utility expansion

First Unit for 600,000-Kva Transformer Bank—World's Largest

THIS is a 200,000-kva single-phase power transformer, one of six Allis-Chalmers is building for a western transmission line. When the first three of these giant units are installed early next year, they will form the highest rated bank of power transformers anywhere. Together they will handle 600,000 kva, almost double the capacity of any three-phase unit or single-phase combination of units previously manufactured.

Techniques used in designing and building these transformers resulted from the completion two years ago of the highest voltage power transformer ever built. The experimental unit, a 600,000-volt power transformer, was built by Allis-Chalmers to prove out techniques far beyond the nation's utility needs for the foreseeable future.

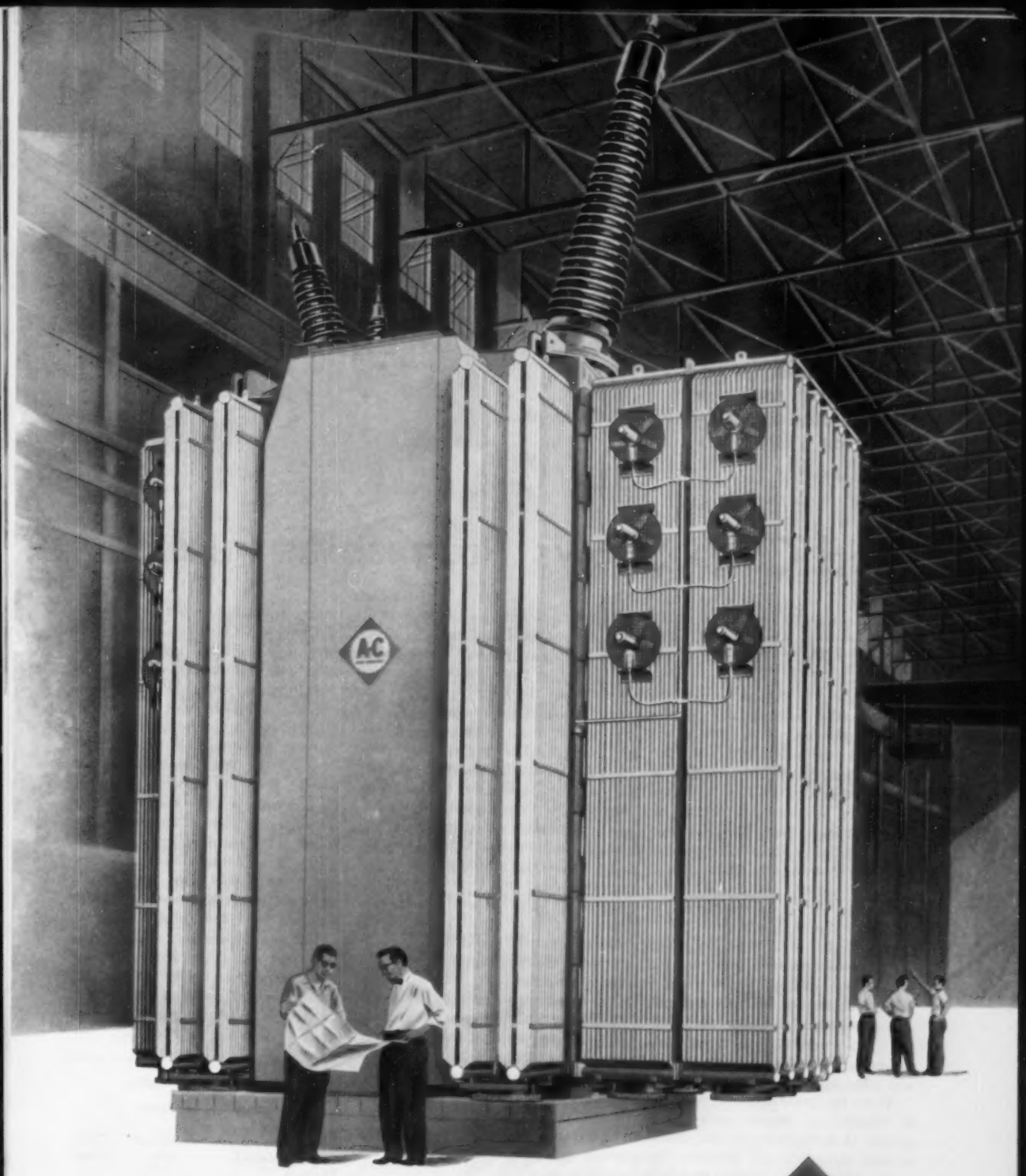
These enormous units are examples of Allis-Chalmers leadership in helping power systems all over the country meet vastly increasing demands for power. Here are some of the features of this transformer worth noting:

- It is corona-free. Allis-Chalmers pioneered the design of corona-free transformers. As a result, regardless of a unit's size and number of parts, insulation damage caused by the creeping effect of corona will never shorten a transformer's useful operating life. Tests that proved this transformer included Allis-Chalmers new switching surge test at 930,000 volts.
- It is a triple rated unit, OA/FA/FA, with two sets of fans. Its ratings are 120,000 kva self-cooled, 160,000 kva with the first set of fans, and 200,000 kva with a second set of fans. As load builds up, fans can be switched on to provide cooling sufficient to handle the larger capacities.
- Allis-Chalmers developed welding techniques to make possible use of heavy plate aluminum in transformer core and coil construction. As a result, the unit is lighter in weight and is easier to ship and install.

An Allis-Chalmers representative will be glad to discuss transformer developments with you at your convenience. Call the nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-4867

NEW ERA IN POWER TRANSMISSION

ALLIS-



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Because it . . .

- **Handles easily without static or spark problems**
- **Allows simple reinjection of precipitated material into boiler**
- **Has a cost comparative with coal, gas, and oil on a Btu basis . . .**

Fluid Coke Shows Promise as Fuel

F. H. **STRACKE**, Group Head, Esso Research & Engineering Co, Linden, N. J.
F. H. **SCHIFFER**, Engineer, Public Service Electric & Gas Co, Newark, N. J.

The utility industry now has a fourth fuel—fluid coke—which can compete economically with coal, gas, and oil. Laboratory tests conducted at Battelle Memorial Institute and full-scale tests at the Essex Station of Public Service Electric & Gas Co show that fluid coke can be successfully burned and has the characteristics indicated above. About 1,000 tons have been burned in the boilers at the Essex Station.

Fluid coke is a new oil-derived material resembling black sand. It is the by-product of a new refinery process developed by Esso Research & Engineering Co. Called fluid coking, it aids refiners by allowing them to upgrade heavy fuel oil to gasoline and other lighter products.

About two years ago Esso Research & Engineering became active in a project to determine ways and means of best using this new product. Because refiners who adopted the fluid coking process would be faced with the problem of moving large volumes of carbonaceous material new to the industry, a long-term development program was established.

At that time the total supply of fluid coke in the world was about 10 tons, from pilot-plant operations.

A four-part program was established to test fluid coke under conditions of limited supply.

1. Theoretical combustion calculations were made to determine if the materials could be used as a fuel. As a result of these calculations, it was concluded that the material was usable in large boiler furnaces as a pulverized fuel, provided the furnaces were operated much the same as for anthracite coal. At first this was discouraging, for it was realized that little anthracite is burned in large boilers. There was however enough evidence to indicate that the material could be burned in furnaces normally using pulverized bituminous-coal.

2. Laboratory-scale tests at Battelle Memorial Institute were the second part of the program. Only a little more than four tons of coke was finally used during these tests.

3. Pilot-plant scale tests were proposed, should the lab tests bear out the theoretical calculations. More coke would then be available from the pilot plant.

4. Last step in the program was to make full-scale tests when enough coke was available.

At the start of this program it was known that by about January 1955, the first fluid-coking units would be operating at the Billings, Mont., refinery of Carter Oil Co. It was planned to have the laboratory and pilot-plant operations well under way by this time to permit full-scale testing with a minimum loss of time.

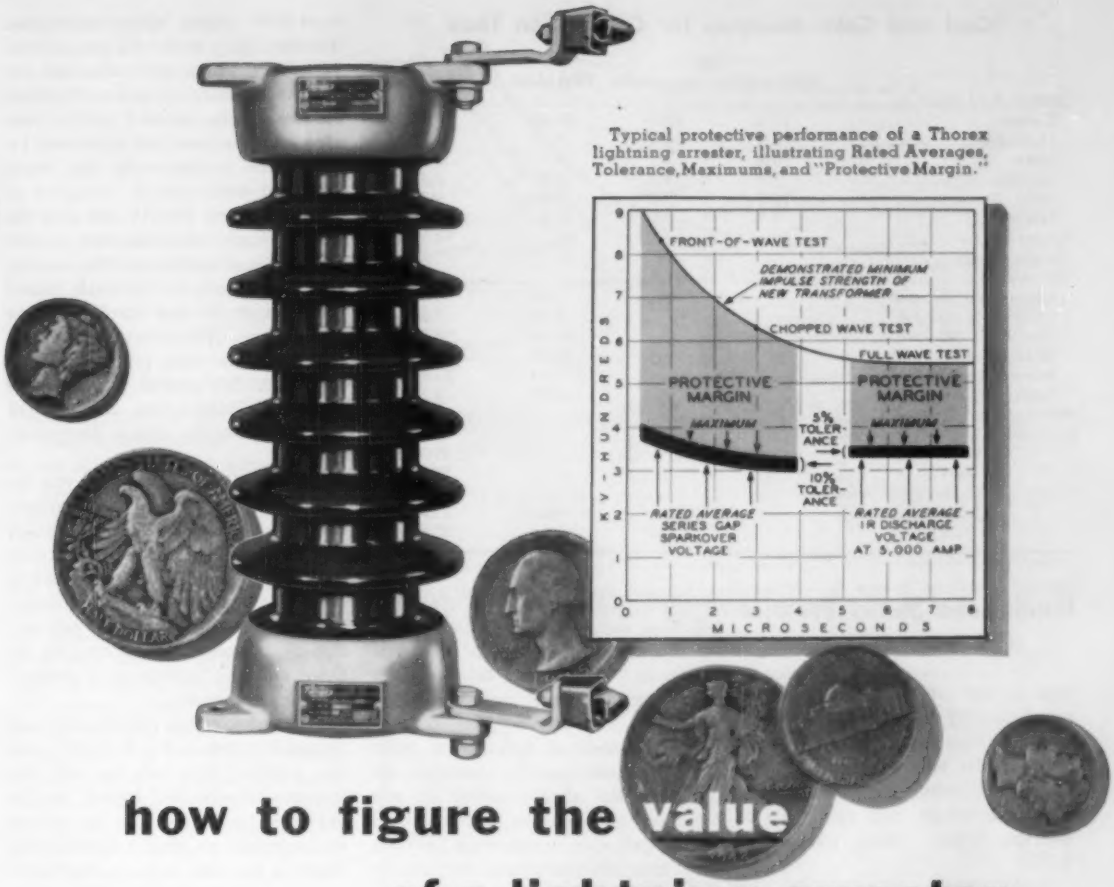
Table (p 24), shows a few of the physical properties of the material from the pilot-plant operation. The last column gives the physical properties of the material now obtained from full-scale operations. The fluid coke is low in hydrogen content, compared with a high or low volatile coal. Carbon content (pilot-plant operation) is about 84.8%, comparable with both high and low volatile coals.

Sulfur in this sample is about 7.7%, compared with 0.6 and 0.7% for the two comparative coals. It does not necessarily follow that the sulfur content of all fluid coke will be as

(*Continued on page* 24)

Analysis of coke and its refuse

Proximate analysis (as received)	Pulverized coke	Coke refuse
Moisture, %	0.30	—
Volatile matter, %	6.75	2.00
Ash, %	0.30	2.55
Fixed carbon, %	92.65	95.45
Sulfur, %	5.15	4.67
Btu	14,111	13,265
Reactivity T_{18} c	348	411
Specific gravity	1.4	1.582



Typical protective performance of a Thorex lightning arrester, illustrating Rated Averages, Tolerance, Maximums, and "Protective Margin."

how to figure the value of a lightning arrester

Is there any positive way to measure your money's worth in the purchase of a lightning arrester? Actually, you can arrive at such a figure, accurate to the second decimal place!

Take rated average catalog IR discharge values. To these add the manufacturer's tolerance. The sum of the two is MAXIMUM protective level -- the only realistic point from which arrester performance can be measured. *Every* Thorex arrester meets or improves on this value. You already know the minimum impulse insulation strength of your equipment. Between the two is a zone called "Protective Margin". It is expressed in kv. Cost of your arrester is expressed in dollars. See what you *pay per kv* of Protective Margin and you will end up buying the O-B Thorex -- giving you not only the greatest protection per dollar, but the greatest protection regardless of cost!

Ohio Brass

MANSFIELD OHIO, U.S.A.

4423-M

Coal and Coke Analyses for Combustion Tests

	Coal		Coke	
	High volatile	Low volatile	Pilot plant	Full-scale unit
Ultimate Analysis				
Carbon	75.4	83.5	84.80	87.30
Hydrogen	5.0	4.6	1.7	2.42
Sulfur	0.6	0.7	7.7	5.17
Oxygen	7.8	4.3	4.2	3.25
Ash	10.1	5.9	0.80	0.30
Nitrogen	1.1	1.0	0.8	1.57
Btu per lb	....	....	.....	14,125
Specific gravity	....	....	.....	1.4
Size analysis				
Retained on 16 mesh	....	....	3.25	5.42
Retained on 30 mesh	....	....	8.92	1.81
Retained on 50 mesh	....	....	58.08	18.77
Retained on 100 mesh	....	....	28.28	43.80
Retained on 200 mesh	....	....	0.74	25.06
Passed 200 mesh	....	....	0.73	5.14
Ash-fusion temperature				
Red's atmos, initial-deformation	....	....	.....	2870
softening	....	....	.....	2900+
fluid	....	....	.....	2900+
Oxide's atmos, initial-deformation	...	...	....	2450
softening	....	....	.....	2530
fluid	....	....	.....	2580

Fluid Coke Shows Promise

(*Continued from page 22*)

high as the tabulated values. Coke represented by this sample was formed from a high sulfur-bearing crude. Should coke be formed from sweet crudes, the sulfur content would be lower. In actual field operations at Billings, sulfur content runs about 5.2%.

Table above also shows the size analysis of the material produced by the pilot plant. Much of it is in the range of 30 to 100 mesh. Theoretical calculations showed the material would probably have to be pulverized to make it serve as a fuel.

Grinding characteristics were investigated in the research labs of Allis-Chalmers Manufacturing Co. Both conventional rotating ball mills and the new vibrating ball mills were used in the tests. Fig 1 shows the results. Other manufacturers of grinding equipment ran similar tests. All indicated that the power required to grind fluid coke was 2 to 2.5 times that required to grind a standard 55-Hardgrove coal to the same fineness. Actual field tests have verified these results remarkably well.

Theoretical effects of fineness of grind and excess air on the burning rates of fluid coke are shown in Fig 2. Earlier test data on coal firing in a similar furnace were used to prorate, on the basis of physical characteristics of the coals and fluid coke, the performance of coke under similar combustion conditions. These original predictions were closely verified by the laboratory work at Battelle Memorial Institute. Two actual test burnings are also plotted for comparison on Fig 2.

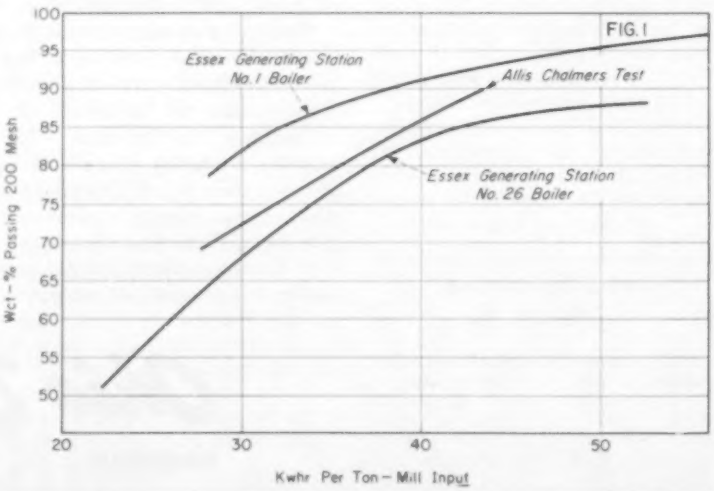
Correlations, at first glance, indicate the predictions are somewhat optimistic. But after adjusting for differences in excess air, ignition time, and combustion temperature between test data and predictions, the test results correlate fairly well.

For example, reducing the unburned of test No. 15 (Fig 2) to allow for an increase in excess air from −2% to +10%, alone brings these data into line fairly well with predictions. Time for ignition after coke has entered the furnace appears to be about the same as the assumed ignition time of 15 milliseconds, as evidenced by the curve's projection to the 100% unburned point, Fig 2.

Curve of test No. 18 indicates the ignition time was somewhat longer. This is reasonable, as the coarser coke, 60% through 200 mesh, would take longer to heat to its ignition temperature. Theoretical curves will displace to the right for greater ignition time. No attempt was made to reflect the ignition-time difference in the predictions for various fineness of coke.

Data used in compiling all test results were calculated by the carbon-balance method. In most instances the dust-sampling method gave considerably lower unburned-carbon values. If the dust-sampling technique were reasonably accurate, a combustion-air metering inaccuracy or an Orsat sampling leakage could account for the discrepancy.

Effect of auxiliary fuel on unburned carbon is shown in Fig 3. In this case the auxiliary fuel was gas and the increase in unburned carbon can be explained by the fact that gas utilizes its theoretical air almost immediately. Most of the coke burning, therefore, is carried on in an atmosphere of a lower oxygen partial pressure than when less auxiliary gas is used at the same total excess air. Unburned



TESTS INDICATE that the power required to grind fluid coke was 2 to 2.5 times the power required to grind a standard 55-Hardgrove coal to the same fineness

carbon for test No. 14 would be even greater, relative to the other tests, if its combustion temperature and excess air were in line with the other tests.

Because fuel oil and coal burn at lower rates, this effect is known to be much less when utilizing them as auxiliary fuels. Even though the unburned coke increases with a greater percentage of auxiliary gas, the unburned in terms of total fuel fired tends to cancel the effect; lessening this factor in pollution.

Better Than Semi-Anthracite

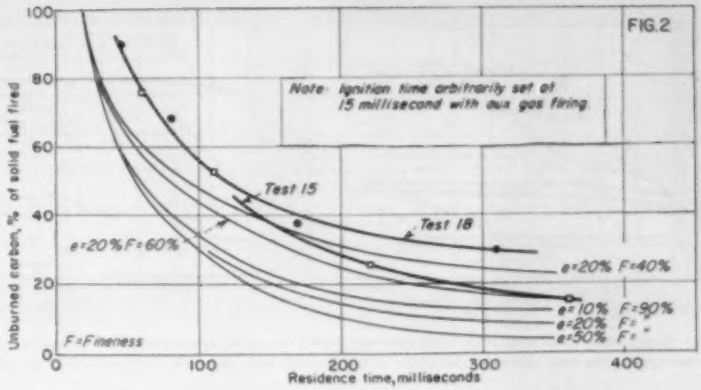
Burning rates of two coals tested by Battelle for another project are shown in Fig 5. Data indicate that, in general, the 90%-fine coke burns considerably better than semi-anthracite at 85% fineness when excess air is taken into account. But it does not burn quite as well as a low-volatile bituminous coal. Based on this and similar tests, it was decided that fluid coke did not require conventional anthracite furnaces.

Unburned carbon levels in all these curves are higher than would normally be expected in a full-scale furnace because of the shorter combustion time used in test furnaces. Full-scale tests show the carbon losses are not so great as those in the curves here.

Boiler manufacturers became interested in coke fuel during the program at Battelle. Several small-scale tests were conducted at various locations throughout the country. Though the tests showed the coke was burning, data collected were incomplete.

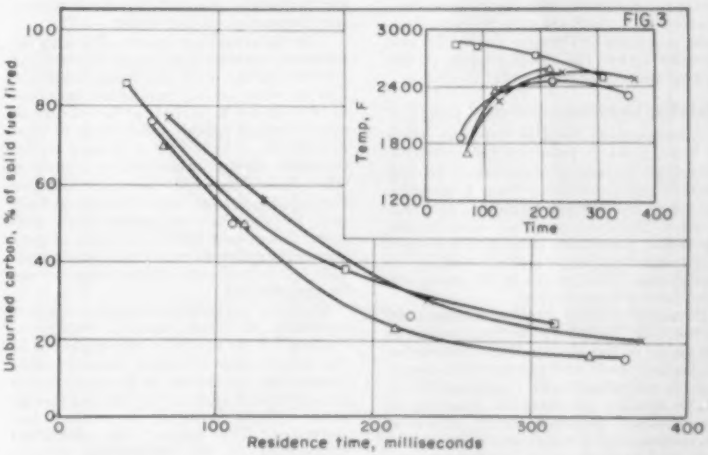
Full Scale Tests Made

With the program at Battelle near completion and the start of the first fluid unit nearly a reality, it became desirable to plan full-scale tests. Arrangements were made with Public Service Electric & Gas Co to conduct these tests at their Essex Generating Station. By early March 1955, 500 tons of coke, transported in hopper-bottom cement cars, were received at the Essex Station. The coke was unloaded and transported to bunkers through the existing coal-belt-conveyor equipment, which has inclines as high as 20 deg. No serious difficulties were encountered. For coke operation, however, the conveyor capacity is reduced to about one half. For continuous operation dusting may be a problem at transfer points.



Source: Theoretical calculations		Fuel primary	Fuel aux	% excess air, e	% thru 200m	Preheat °F	Avg. temp of comb gas
		Fluid coke	35 %G	10	90	"	2450
		"	"	20	"	"	"
		"	"	50	"	"	"
		"	"	20	40	"	"
Test No. 15	□	"	"	20	60	"	"
No. 18	●		14%G	-2	90	450	2275
			35%G	-2	60	450	2450

CALCULATIONS SHOW that fineness and percent of excess air have marked effect on percent of unburned carbon. Test results verified these predictions



Source: Battelle test		Fuel Primary	Fuel Aux	% excess air	% thru 200m	Preheat F	Avg temp of comb gas
11	△	Fluid coke	None	-3	90	450	2300
15	○		14%6	-2	90	450	2275
12	×		32%6	0	90	450	2300
14	□		67%6	9	90	450	2760

AS GAS USES its theoretical air almost immediately, unburned carbons increase with an increase in auxiliary gas fuel. This would not be so with coal or oil

Because the effect of the new fuel on an actual boiler was unknown, a Babcock & Wilcox 605,000-lb-per-hr, 1,475-psig, 950-F radiant-type unit was chosen for the first tests. This boiler, No. 26, was installed in 1938. Overall heat-release rate is 27,000 Btu per hr per cut ft. The boiler is equipped with air heaters, economizer, and electrostatic precipitators.

Pulverized fuel is supplied by two Foster-Wheeler Type D-5A ball mills, each feeding three B&W multiple-finger intertube burners which downfire into the primary furnace. Before start of the tests this boiler had been oil-fired for a number of years. Early test runs were made on this unit to check the ability of the auxiliary

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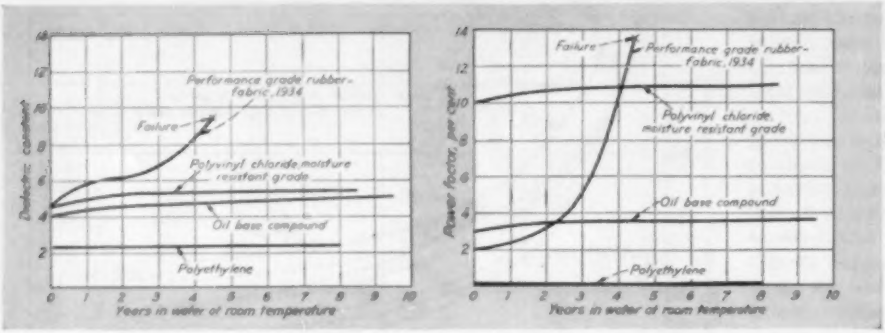


CURRENT TRENDS

No. 3 in a series of articles

These graphs show some long-time 1000-cycle test results on typical insulations. Time consumed retards development of new types. The text explains limitations of accelerated tests and how interpretation is affected by application.

Moisture Resistance of Cable Insulations

In sharp contrast to the situation only 15 to 20 years ago, moisture need no longer be considered a serious hazard to cable operation.

Two factors have helped materially in the relatively rapid attainment of this present degree of protection: (1) New insulating materials and compounds have been developed which possess an inherent high degree of moisture stability; (2) Short-term laboratory test methods now help to evaluate moisture resistance correctly and thereby speed the development of the newer insulating materials.

Metallic sheaths—pro and con

A continuous metallic covering, such as lead sheath inherently provides complete moisture protection to the underlying insulation. But a metallic sheath is not always advisable or practicable. Hazards such as electrolysis, corrosion, vibration, plus added weight and economic factors often nullify its usefulness. This seems to be more the rule than the exception.

Because of these problems presented by metallic sheaths, attention turned to the study of the ability of the conductor insulation itself and nonmetallic coverings to withstand water and moisture. These studies involved the theories of mechanics of moisture attack, effects of environmental conditions, methods of test, and evaluation of insulating materials and coverings with particular relationship to actual performance and experience.

Theories

The mechanics of water absorption have been comprehensively investigated. While there is a lack of agreement in terms of actual operation, it is generally agreed that there are at least two physical methods by which water might affect insulation: by actual "absorption" and "diffusion."

"Absorption" is a direct layer effect in which the successive outer layers of the insulation gradually become water-soaked. Tests for increased weight or electrostatic capacitance of the dielectric reflect changes by absorption.

"Diffusion"—more difficult to measure—takes place when water permeates the insulation and establishes irregular conducting paths of water from the conductor to the outer surface. Its study involves additional parameters such as pressure and rate. A weight test would not disclose "diffusion" but some sensitive electrical quantity such as insulation power factor or resistivity might be related to it.

The effect of moisture upon cable characteristics can probably be best explained in terms of its electrical action which provides a direct determination. The insulating properties of a dielectric are adversely affected by the conducting properties of the water.

The determining feature for any insulation operating under an alternating current stress is its electrical stability. For as soon as its insulation becomes erratic under a particular set of circuit conditions, a cable's usefulness to that circuit is ended. For a power cable, complete electrical instability is reached when dielectric losses become excessive enough to permit actual thermal failure. For a communication cable, this point is reached when attenuation constants increase so much that an acceptable level or quality of signaling cannot be maintained.

In cable insulation it is not so much a question of "how much" water, as "where" it is. The ultimate criterion in the penetration of water through cable insulation, therefore, *is its effect upon the electrical stability of the cable—all other effects being of secondary importance.* The longer the electrical properties of an insulation remain relatively constant in the presence of water, the better is the true moisture resistance of that insulation.

Long-term unaccelerated moisture tests have been fundamental and helpful in adding to the knowledge of moisture absorption. But a minimum of two years' immersion period has usually been necessary to establish whether or not an insulation was truly electrically stable—and many such tests have been continued on many types of insulations for 5-year periods and longer. Something of a more practical nature was obviously needed and several short-term test methods, based upon electrical measurements were devised and found to give a relatively truthful index of moisture resistance.

Test methods

One such short-term test control is the temperature of the water bath. This has been found to have a substantial accelerating influence, although certain caution is needed in establishing a maximum test temperature that will not alter results because of chemical or physical changes. For most materials and purposes, a bath temperature of 50° C. has been found satisfactory. Further, the effects of thickness of insulation are reflected in the rate of change of electrical properties. Relatively thin walls (preferably not less than 1/32") will disclose the effects of water much sooner than heavier walls which may require several months immersion to indicate a correct trend of measurements.

In performing electrical measurements, an increase in the applied test voltage will generally cause a truthful "acceleration." For example, measurements of power factor and capacitance at 60-cycle voltages up to 80 volts per mil of insulation thickness provide a reliable means of testing insulated conductors intended for 60-cycle power service applications.

An electrical test which consists of measurements of 60-cycle capacitance and power factor at 40 and 80 volts per mil on cable specimens immersed in water at 50° C. is now the only moisture test recommended by IPCEA for power and control cables. It is sometimes called the Stability Test. Details and limits for this and other tests are set forth in the recent IPCEA wire and cable specifications, Appendix N—Method EM-60.

In conclusion

The various possible effects of moisture on insulation involve a careful analysis of the end use before choosing materials and design. But it is certain, at least, that specification of lead sheathed cable designs is no longer mandatory for wet locations. And there is no question that we are headed for still better moisture-resistant insulations—and better tools aiding our understanding of the problem of moisture.

For further study of this subject reference is made to a paper entitled, "What Moisture Resistance Means in Cable Insulation" by R. C. Graham, Chief Engineer, Rome Cable Corporation, which we will gladly send on request.

ROME CABLE CORPORATION, Rome, New York

Fluid Coke Shows Promise

(*Continued from page* 25)

equipment, feeders, and ball mills to handle fluid coke and to acquaint operating personnel with solid-fuel firing. A minor adjustment was made to the feeders to enable them to handle fluid coke.

Mills supplying this boiler were rated at 16.5 tons per hr when handling 91-Hardgrove 5% moisture coal and grinding it to 82% through 200 mesh. At the same fineness mill capacity was about 6 tons per hr when handling coke. This compared favorably with the original derating estimate of 2.5. Lower curve, Fig 1, shows results of tests on these mills.

Reinjection is Possible

Reduced load tests on this boiler were made with coke providing 52 to 64% of the total heat supplied. Mills produced a coke of 46 to 90% through 200 mesh. Full-load runs were made with coke supplying 17 to 52% of the total heat provided, with about the same range of fineness. At higher coke loadings fineness from mill decreased, and unburned coke to the precipitators increased. While unburned coke to the precipitators was high, it was not felt to be excessive. Based on the reactivity of the precipitator samples collected, it is believed the material could be reinjected and successfully burned.

At full load, boiler efficiency during the tests ranged from a low of 78.8% when coke supplied about 37% of the heat to a high of 86.4% when coke supplied about 17% of the total heat. With an increase in coke fineness, losses to the precipitators decreased. Based on the percent of total fuel fired, unburned coke to the precipitators ranged from a low of 2% with a coke fineness of 88% through 200 mesh to a high of about 10% when firing coke of 51% through 200 mesh.

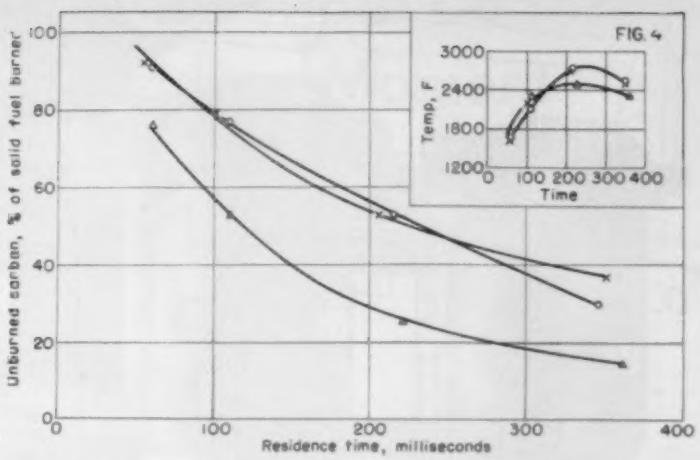
Tested in Larger Boiler

After burning about 500 tons of coke without noticing any detrimental effects on No. 26 Boiler, it was believed desirable to test a newer and larger boiler—No. 1 Boiler, installed in 1947. This boiler is a B&W, 900,000 lb-per-hr radiant-type unit rated 1,500 psig and 1,000F at the superheater outlet. Over-all heat-release rate is about 22,000 Btu per hr per cu ft. Boiler is equipped with air heaters, economizer, attemperator, and electrostatic precipators. Pulverized fuel is supplied by three Foster-Wheeler Type D-5B ball mills, each feeding four B&W circular burners equipped for coal, oil, or gas firing.

Combustion in this unit appeared much better than in the No. 26 Boiler. Fig 1 shows comparative grinding tests. Full-load boiler efficiencies ranged from a low of 87% when coke supplied 17% of the total heat to a high of 88% when coke supplied 45% of the total heat. Precipitator losses were considerably less than with No. 26 Boiler.

The circular burners of No. 1 Boiler appeared to be better suited to coke burning than the intertube burners of No. 26 Boiler. Moreover, the

(*Continued on page* 43)



SIZE DISTRIBUTION of coke fired for 40-and-60%-through-200-mesh test could account for the crossing of burning curves in the earlier stages of combustion

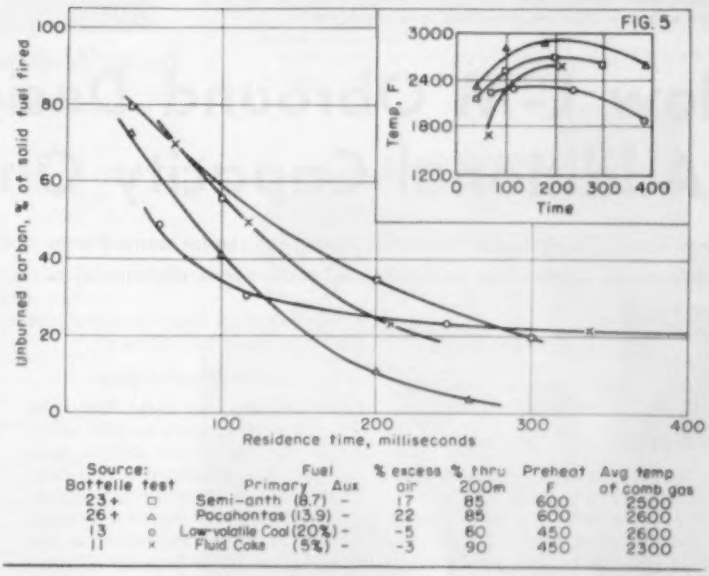
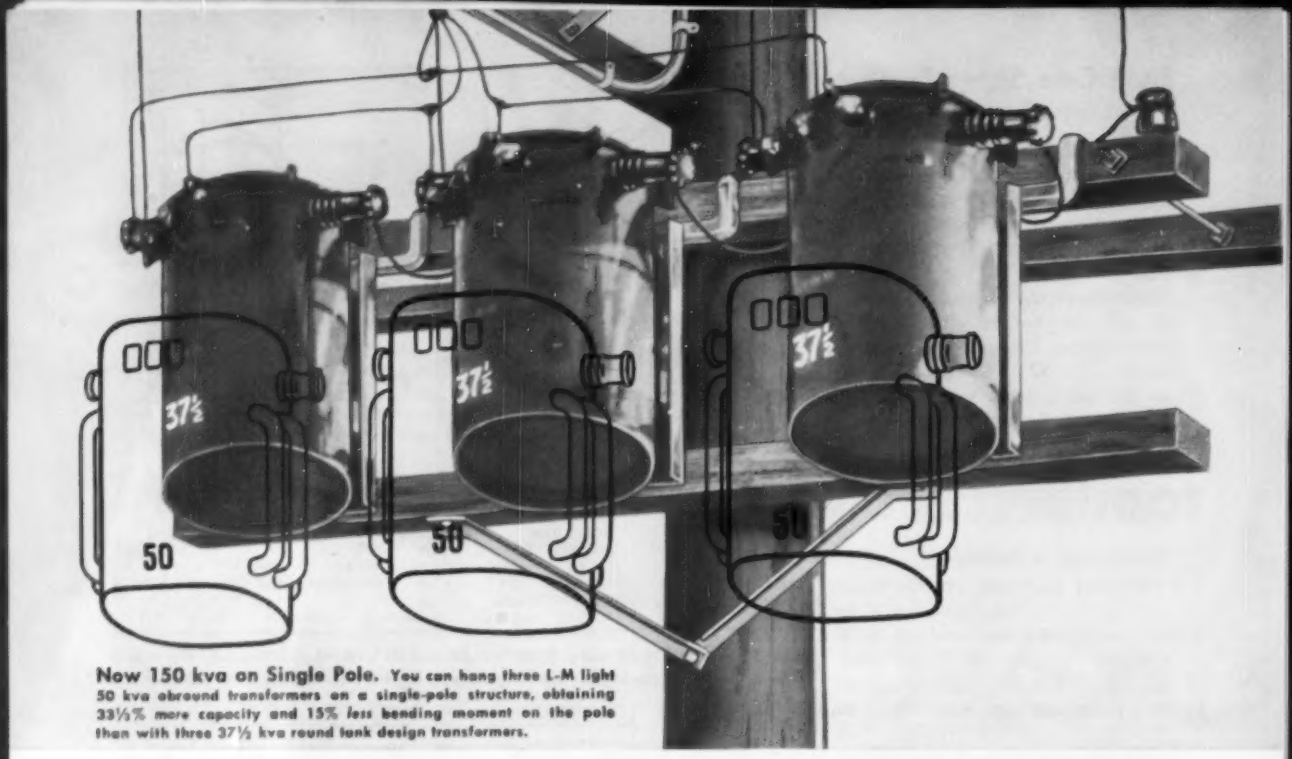


FIG. 5
Unburned carbon, % of solid fuel fired
Residence time, milliseconds
Temp, F
Time
Source: Battelle test
Fuel Primary
Aux
% excess air
% thru 200m
Preheat F
Avg temp of comb gas
23+ □ Semi-anth (8.7) - 17 85 600 2500
26+ △ Pocahontas (13.9) - 22 85 600 2600
13 ○ Low-volatile Coal (20%) - -5 60 450 2600
11 × Fluid Coke (5%) - -3 90 450 2300

COMPARISON WITH COAL is shown. Ninety percent-fine fluid coke burns better than semi-anthracite at 85% fineness when excess air is taken into account



Now 150 kva on Single Pole. You can hang three L-M light 50 kva obround transformers on a single-pole structure, obtaining 33⅓% more capacity and 15% *less* bending moment on the pole than with three 37½ kva round tank design transformers.

How L-M Obround Design Provides Additional Capacity On Structures

New obround tank design is smaller, lighter, has shorter moment arm, retaining all outstanding Round-Wound® performance characteristics.

By ALVIN B. COYLE
Manager
Transformer Sales
Line Material Company

Now you can hang transformers of larger capacity on a pole structure with L-M's lighter, smaller obround transformer tank design. The additional capacity is obtained without changing outstanding performance characteristics of L-M's Round-Wound design.

Less Weight

The obround design provides a smaller tank with less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where necessary to provide the cooling surface for maintaining the same low hot-spot and top oil temperature-performance characteristics found in all other L-M transformers. In addition, the transformer's repetitive overload capacity is improved as the result of the faster transfer of heat from the coils to the cooling air.

Shorter Moment Arm

L-M's new obround design brings the center of gravity closer to the pole, which reduces the moment arm distance from the pole. The combination of lighter weight and less moment arm distance substantially decreases the total bending moment on the pole and crossarms, and thus greatly increases the potential capacity of all your transformer structures.

You can take advantage of savings such as these:

Larger transformers can be hung closer to the top of the pole, eliminating the need for a higher pole and additional spacing.

Single-pole, three-phase transformer structures can now serve more load with the additional transformer capacity available. New 50 kva obround transformers have less bending moment on the pole and on crossarms than previous 37½ kva round tank design. Here L-M's light obround transformers may eliminate the need for costly two-pole structures.

Pole-Mounted 167 kva Transformers

L-M's light-weight 167 kva transformer can be pole-mounted; provides a full 167 kva of capacity on a single-pole structure. And it, too, provides L-M's well-known overload capacity.

To serve three-phase loads you can hang three L-M light 167 kva transformers or 500 kva on a two-pole structure, eliminate expensive platforms, ground pads, or vaults in many instances, and make further use of existing facilities.

L-M's light, obround design transformers are available in single-phase 5 kva through 167 kva in each standard distribution voltage class.

Get Details On Lighter-Weight Obround Transformers

Ask the L-M Field Engineer for application information, weights and dimensions on L-M obround transformers and the exclusive Round-Wound design. Or write Mr. Coyle at Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

219 R

LINE MATERIAL Transformers

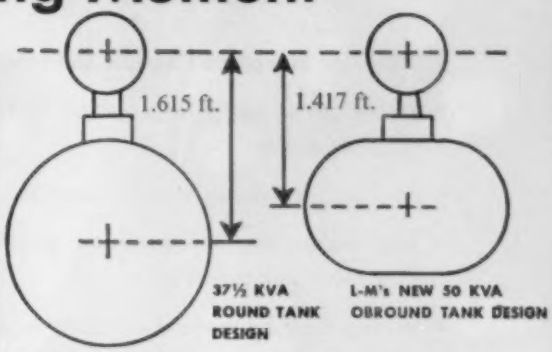
You Can Hang 33⅓% More Capacity With 15% Less Bending Moment

COMPARE 37½ kva round tank design
50 kva L-M obround tank design

37½ kva ROUND tank design:
Moment arm from center of pole. 1.615 ft.
Weight. . . . . 800 lbs.
Bending moment 800 x 1.615. . . . **1292 ft.-lbs.**

50 kva L-M OBROUND tank design:
Moment arm from center of pole. 1.417 ft.
Weight. . . . . 775 lbs.
Bending moment 775 x 1.417. . . . **1098 ft.-lbs.**

L-M's new 50 kva obround transformer has 15% less bending moment than the 37½ kva round tank design.



Less Bending Moment—New obround tank design reduces the moment arm distance from the pole. The combination of lighter weight and smaller moment arm distance greatly decreases the total bending moment on the pole. When crossarm mounted, the lighter weight substantially reduces the bending moment on the crossarms.

Less Weight, Faster Cooling—The obround design affords a small tank and less transformer oil, resulting in a lighter, easier-to-handle transformer. Cooling tubes are installed where required to provide sufficient cooling surface.

In addition, oil ducts, located throughout the coil and between the coil and cruciform cross-section of the wound core, contribute to uniform efficient cooling.

Rapid transfer of heat provides faster cooling of the unit, increasing its repetitive overload capacity.

Plus Outstanding Round-Wound Performance Characteristics

Both the physical and performance characteristics of L-M's obround tank transformer were considered in detail. The advantages of lighter weight and shorter moment arm were accomplished with no sacrifice of outstanding Round-Wound performance characteristics.

Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.

High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage windings and the core. This permits ample creepage distance with generous insulation.

High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

High Short-Time Overload Capacity: cruciform cross section of wound core and ducts between windings and layers provide excellent cooling for the entire unit.

Now you can hang 167 kva directly on the pole, yet L-M's new lightweight obround has full 167 kva continuous rating and no sacrifice in overload capacity.

LINE MATERIAL
Transformers

219 -B

MEETING REPORT

- Statistics alone won't double our sales
- We've got to get a larger share of the durable goods dollar
- Appliance servicing must be improved
- The inexperienced consulting engineer is taking away our business
- Wiring must be made a necessity in people's minds, not a luxury . . .

Said These Speakers ➡ as . . .

C. L. Osterberger | Harllee Branch, Jr | J. M. McKibbon

SEE Plans "Selling That Clicks in '56"

Consumption of electric energy during the next ten years will not double simply because statisticians say so. It will double only if the kwhr are sold. And opportunities are unlimited. This was the message of Harllee Branch, Jr, president, Edison Electric Institute, at the Southeastern Electric Exchange Sales Conference, which had the theme of "Selling that Clicks in '56". The conference was held recently at Atlanta.

He pointed out that utility salesmen are "selling a brand new way of life". Today the housewife has 56 electric appliance available—equivalent to a staff of 35 servants. In the next 15 years Branch predicted, there will be 100 appliances.

Must Up Share to 18%

To make the sales predictions come true, 1.8 billion appliances will have to be sold between now and 1973, stated J. M. McKibbon, Westinghouse Electric Corp. This means we'll have to sell hard to get a larger portion of consumers disposable income for durable goods. About 15% of a person's total income is available for discretionary spending for durable goods. To achieve the forecasts the industry must get 18% of that durable goods discretionary spending — not the 15.5% realized in 1954.

Future growth is closely related to strength of retailers, McKibbon continued. He suggested that utilities should help make dealers better business managers, back them with strong adequate wiring support, and acquaint them with better demonstration methods. One way to help dealers improve their managing is for utilities to provide a public accountant with good business management experience as a consultant.

One bottle neck to the future of the industry is servicing of appliances, said John C. Sharp, Hotpoint, Inc. The public does not object to charges for service if it is promptly given, correct, and not required at unreasonable intervals. However, he pointed out, the how and where of servicing have not been determined.

Because appliance servicing is "the secret to our future success," emphasized Edwin O. George, Detroit Edison Co, "utilities have the responsibility of getting a program of improvement started." After enumerating some of the difficulties in making adjustments to and replacing and stocking parts for some appliances, George pointed out that these result in high repair costs, needless delays, and angry customers.

All previous speakers mentioned the major headache of adequate wiring. And Allan C. Mustard explained how South Carolina Electric & Gas Co's successful promotion program operates, with free lamp bulbs as an incentive:

The customer submits his plans to the utility at least 30 days before rewiring is to begin, Mustard said. Then improvements are recommended. At this time the customer lists his appliances and those he expects to purchase. He also selects a dealer from whom he will receive the free lamps.

The dealer gets the list. When wiring is completed, the company gives the customer a requisition for the lamps. Wiring is not policed, but spot checks indicate that it is installed in accordance with the suggested plans.

Get on Job First

If utilities are to combat competition successfully, "we must get on the job first and sell the prospective customer," declared Roy W. Wages, Georgia Power Co. One dangerous form of competition, he warned, is the inexperienced customer assisted by aggressive turbine salesmen and inexperienced consulting engineers.

Presiding at the general sessions were C. L. Osterberger, Louisiana Power & Light Co, and J. S. Gracy, Florida Power Corp. The next day conferees met with their respective

E. O. George | R. W. Wages | J. S. Gracy | G. South Dunn | Frank E Wiatt

committees. Reports of these meetings follow.

Industrial Power

"Gold-plated" service to provide maximum reliability must be supplied to the petrochemical industry, H. Carl Bauman, Chemical Construction Corp, said. Need for service that is practically free of outages or voltage dips of more than 60 cycles is required for safety and profits.

The utility company can almost always supply gold-plated service better than the petrochemical plant when all emergency contingencies are considered, stated H. L. Deloney, Louisiana Power & Light Co. This is principally because the utility has numerous generating plants in different areas and is interconnected with other systems.

It is essential that undervoltage protection be retained in the interest of safety when applying time-delay undervoltage devices, cautioned H. B. Greear, General Electric Co. In applying such controls, he suggested that industrial engineers should:

1. Minimize the number of protective circuits that must be continuously energized by normal ac power.

2. Provide time-delay relays for motor starters to ride over momentary voltage dips.

3. Provide flywheel motor generator sets where equipment cannot be permitted to drop out during any voltage dip.

4. Consider dc instead of ac for continuously energized circuits.

5. Use circuit-closing protective devices, as practiced in electric utility industry.

Residential and Rural Sales

R. J. Miller said the quick recovery water heater was being pushed by Cleveland Electric Illuminating Co to overcome builder objections of high initial costs for extra storage in large units and slow recovery in smaller ones. He also saw quick recovery as a sales boon in the old-home market. First, it allows lower prices as fewer models are needed, and dealers and plumbers can reduce stocks. Second, it permits one simple sales story on recovery and operating costs to be told.

Cleveland studies, he said, showed that the quick recovery unit would add about 4 kw to the individual customer's peak and about 1¼ kw to the system peak. Comparable figures for a NEMA standard 82-gal heater indicate 2 kw and 1 kw respectively. Studies of load characteristics and cost to serve showed incremental rate of return for the high-use heater was quite adequate and allowed some money for sales promotion expenses.

Speaking of wiring, Frank E. Wiatt, Cincinnati Gas & Electric Co, said too many well-planned wiring layouts by the utility are reduced to bare code minimum with the cheapest competitive grade of materials when the builder or contractor gets through with them.

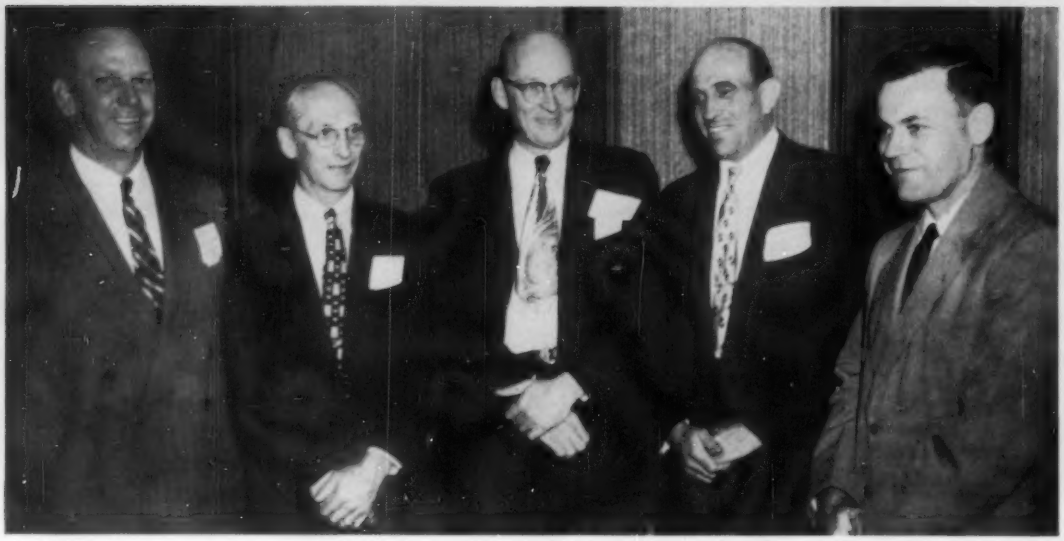
Thomas F. Galvin, GE, offered another approach for solving the inadequate wiring problem and building load: Promotion of the built-in kitchen. A built-in kitchen center plus a water heater and refrigeration, he said, can make for a total 7,500-kwhr annual load in major appliances alone.

Delving into house heating, Fred Kreiser, Edwin L. Wiegand Co, said five to six million electrically heated homes would have to be added to lines in the next five years to compensate for an expected cooling load of 18 million kw in the same period. He said utilities should have a program to: determine amount of resistance heating needed for compensating winter load and set a marketing plan to develop this load at proper rate; train employees to understand it and sell it; carry program to architects, builders, etc.

Agricultural Development

That lack of three-phase service in much of the rural area is putting a crimp on the development of irrigation loads was voiced by several conferees.

Ross Mauney, Arkansas Power & Light Co, said the inability to serve the load on single-phase lines is turning the farmer to other energy for pumping, notably butane. Joe N. Howard, Duke Power Co, said many farmers use several sources of water making the wiring expensive. But John Folkes, Florida Power Corp, declared that special irrigation rates in



T. D. Hoskins | H. B. Greear | H. L. Deloney | H. C. Bauman | E. W. Steele

some Florida areas are helping build its use particularly on flue-cured tobacco and citrus and vegetable crops.

Milk Coolers Pose Problem

Sales incentives and in some areas outright directives by dairy processors are putting more and more bulk milk handling equipment on farms, pointed out Harold Beatty, Edison Electric Institute. Power suppliers with heavy dairy loads are becoming concerned about the effect of large direct expansion-type milk coolers on their peak loads. Experience shows this type of cooler will add from 3 to 7 kw per dairy farm to the system peak. Furthermore, this load is only for four to six hr a day and consequently lowers system load factor as all coolers tend to operate concurrently with little diversity factor. For this reason some power suppliers are thinking of encouraging ice bank type of milk coolers which have a much lower kw demand—0.75 to 2 kw—and operate 16 to 20 hr. He cited a University of Wisconsin report comparing the two cooling methods. This information, he said, would be helpful in determining rates and other policies for serving the load.

To promote underfloor electric brooding, Alabama Power Co finances the farmer's construction costs up to $500, declared John Bryan. Money is repaid over a 24-month period.

E. E. Shelton, Alabama Power, said experiments show brooders using a combination of 250-w and 125-w infrared lamps give best results. Lamps are mounted 15 in. apart using four 125-w and four 250-w lamps in alternate receptacles. A thermostat is used to switch the brooder from 250-w lamps to the 125's at 50F or above. It has been found that day-old chicks will stay comfortable under 125-w lamps at 50F or above. He recommended that the thermostat be set to operate at 50F during the first week of brooding and lowered 5 deg each week for the remainder of the brooding period. During summer similar 5-deg drops from 85F are recommended.

Cost of this type brooding plus some source of supplemental heat, said Shelton, ranges from $0.009 to $0.014 per chick based on year-round brooding.

Commercial Load Building

William L. Byrne, Ebasco Services, Inc, came up with these observations: (1) $2 billion in commercial revenues must be added and annual use per customer must be raised to 25,000 kwhr in the next ten years if Electrical World's forecast of 175 billion of commercial kwhr by 1965 is to be realized, (2) More than half of all commercial kwhr sold will have to come from lighting, (3) The utility will have to provide the leadership and a major part of the promotion. He cited American Gas & Electric Co's "Operation Main Street" lighting program which hinges small town industrial development on the modernization of their business districts. AG&E uses 25-min slide lectures before local civic groups to whip up enthusiasm, and Byrne invited other utilities to make use of the same techniques.

Service Ups Cooking Sales

Ralph Layfield told how strong dealer contact work and a policy of servicing equipment is building the commercial electric cooking load for Georgia Power Co. "We'll sell over 10,000 kw of equipment this year," said Layfield; "and if we put the time into it, we could sell as much as 25,000 kw in 1956."

The heat pump drew a variety of comments. C. Frank Contois, Gulf States Utilities Co, offered a list of promotional methods, commenting, "No commercial building should be overlooked as a heat pump prospect." Consulting Engineer Cary B. Gamble of New Orleans had some definite ideas about what the utility can do to expedite heat pump jobs and smooth its relations with members of his profession: The utility should do the designing and may have to go to subsidizing the engineering of heat pump installations. Most jobs would be better off using larger size heat pumps instead of small ones with strip heaters. In fact, it would even be better to supplement with panel heating instead of using strip heaters, he declared.

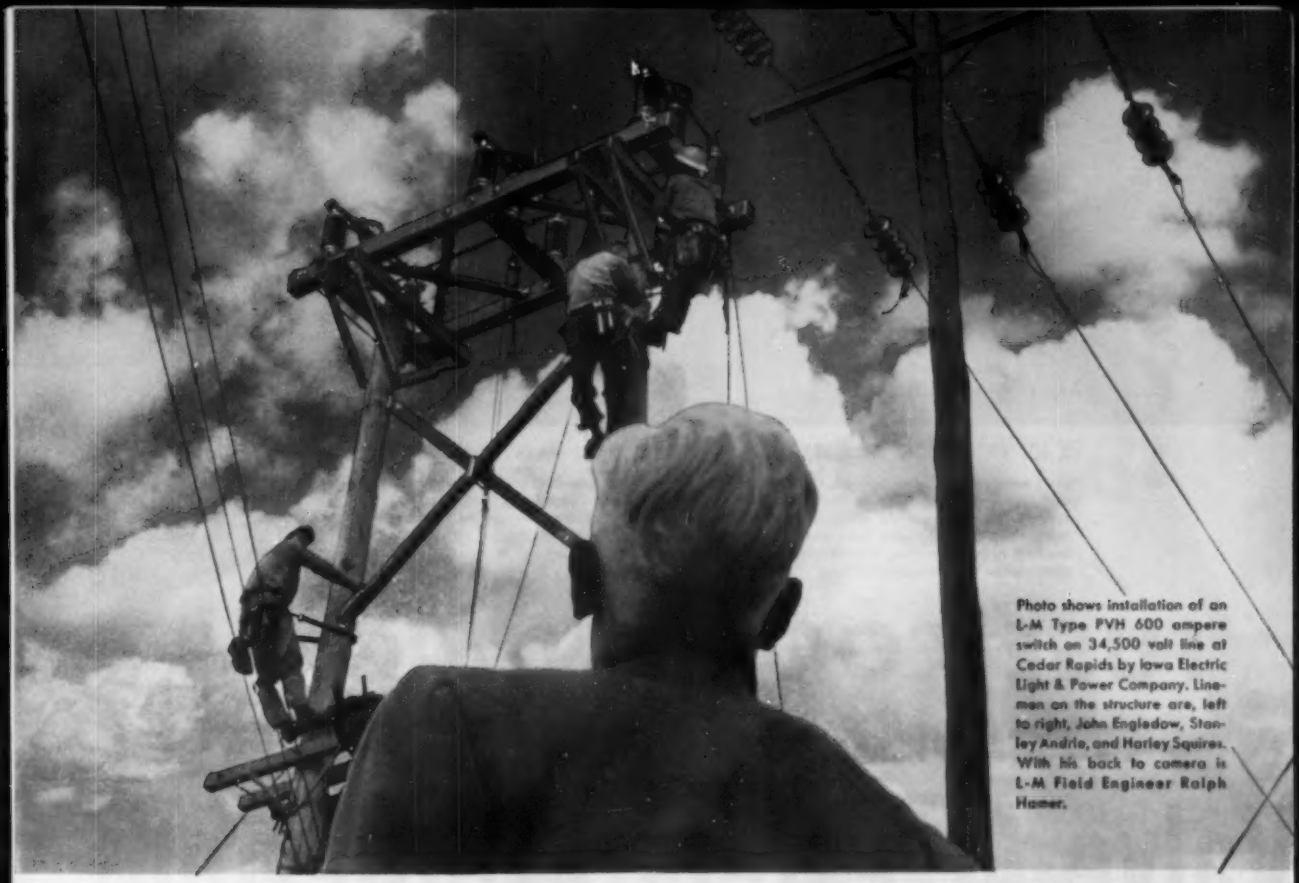


Photo shows installation of an L-M Type PVH 600 ampere switch on 34,500 volt line at Cedar Rapids by Iowa Electric Light & Power Company. Linemen on the structure are, left to right, John Engledow, Stanley Andrle, and Harley Squires. With his back to camera is L-M Field Engineer Ralph Hamer.

Iowa EL&P Installs L-M PVH Switches To Cut Sparkovers on Lightning Surges

by
HOWARD K. HOLLINGSHEAD
District Operating Mgr.
Iowa Electric Light
& Power Company

The photograph shows the installation of an L-M type PVH air break switch on our lines at Cedar Rapids. The new switch replaced an older switch on a point in the lines that is operated "normally open."

The former switch operated satisfactorily as a normally closed switch, but on normally open service the inadequate clearance caused line tripouts and switch insulator damage caused by lightning surges during thunderstorms. During the summer of 1954, eight of the nine insulators on the old switch were damaged.

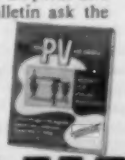
We expect that the new PVH switch has ample clearance and thus will eliminate the trouble. As additional assurance against surges piling up and spilling over, arresters have been installed on each side of the switch one span away.

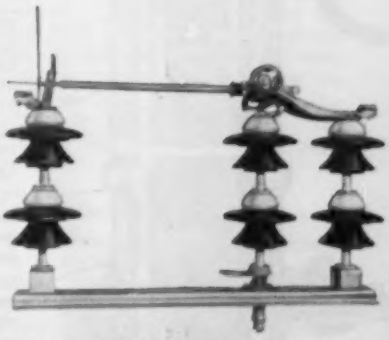
Since it was not practicable to de-energize the circuits joined at this point during installation time, they were dead-ended temporarily on the single pole shown at the right of the photograph, while the switch is being installed on existing poles.

The new L-M switch is being installed under the supervision of Crew Foreman Howard Norris. He and all the members of the crew were particularly pleased by the rugged simplicity of the PVH switch and the ease of assembly and adjustment. He particularly liked the identification of the interphase bars and the foolproof method of installing them.

Get This Bulletin For Complete Information

L-M offers a complete line of vertical air break and hook switches through 1200 amperes and 69 kv. For information and bulletin ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

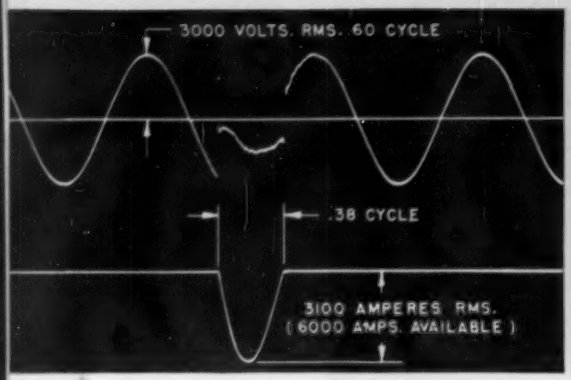


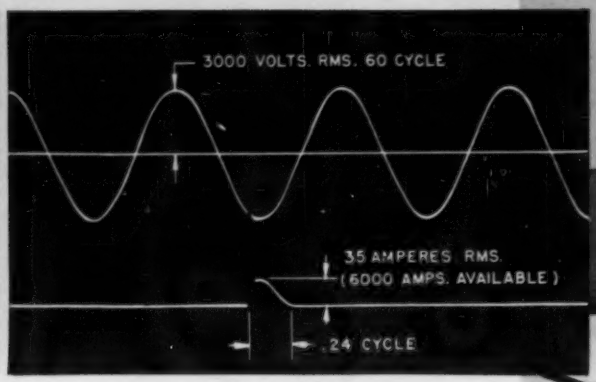


L-M type PVH switches offer ample clearances; castings of aluminum bronze alloy which make them exceptionally strong and light; and the design provides a powerful lever advantage to assure positive operation regardless of ice, corrosion, or long periods of non-operation.

210

LINE MATERIAL
Power Switching Equipment





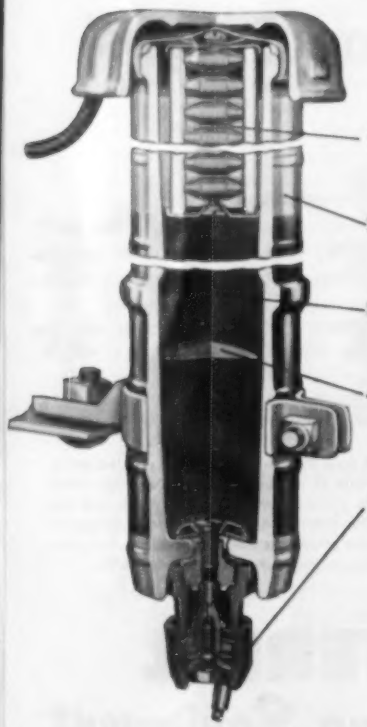
3 KV EXPULSION ARRESTER **3 KV VALVE ARRESTER**

The oscillograms show the operation of typical expulsion and valve arresters handling a lightning discharge with 6000 amperes fault current available. The expulsion arrester, left, draws 3100 amperes follow current; the valve arrester, right, draws only 35 amperes. If expulsion arresters are used, all sectionalizing fuses must be heavy enough to handle 3100 amperes for at least one-half cycle. However, if valve arresters are used, much smaller fuses can be installed, and coordination poses no problem.

FUSE COORDINATION

...another reason why

Valve Arresters Are Better



Features of L-M's Valve Arrester

1. The ladder spark gap is designed to provide a perfect balance between 60-cycle sparkover and impulse sparkover.
2. The Pyrex glass housing permits visual inspection to detect mechanical or electrical damage.
3. "Granulon," the valve material, is able to withstand severe heating which accompanies heavy strokes of lightning.
4. Lens-shaped electrodes in the element compensate for "skin effect," assuring uniform distribution of surge current throughout the valve element.
5. L-M's exclusive "Isolator" gives positive assurance against grounding feeders by instantly disconnecting the ground lead from the arrester if the arrester should ever become damaged.

FOUR PRINCIPAL REASONS

for recommending valve over expulsion type arresters

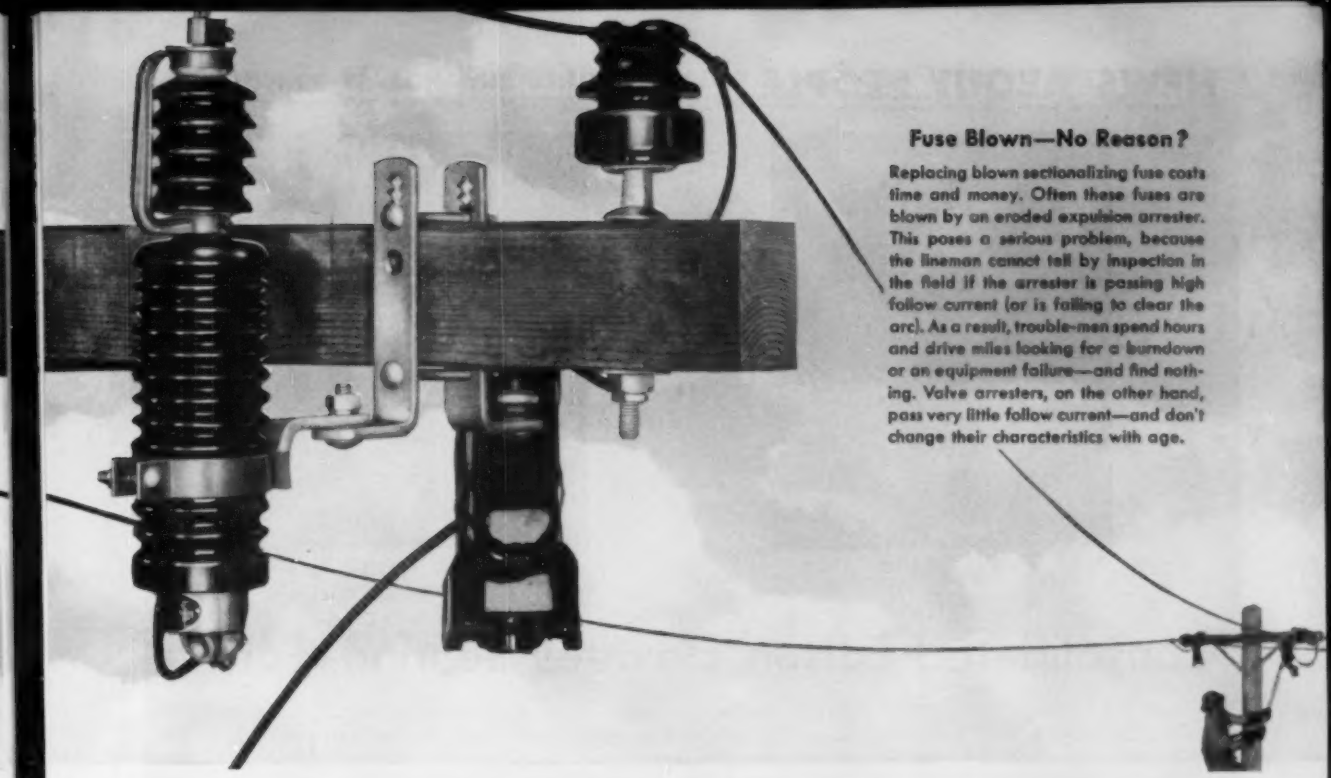
1. Better Protective Characteristics—The valve arrester sparks over more quickly and at lower voltages on lightning surges. Transformer end turns are not stressed by a complete voltage collapse following sparkover. Although the expulsion arrester provides a satisfactory level of protection for most transformers, a higher degree of protection is available through the proper application of valve arresters.

2. Unlimited 60-Cycle Capacity—The application of the valve arrester is not limited by the available short-circuit current. The expulsion arrester, operating on a pressure principle, has a definite top limit and may have a bottom short-circuit current rating. (Too much current causes it to explode; too little fails to expel the arc.)

3. No Fuse Coordination Problems—The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity. Expulsion arresters can pass high follow current which may cause unnecessary operations of sectionalizing devices.

4. Longer Life—The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited. The expulsion arrester ages and changes its characteristics because atmospheric conditions and erosion due to operation affect the fibre.

LM LINE



Fuse Blown—No Reason?

Replacing blown sectionalizing fuse costs time and money. Often these fuses are blown by an eroded expulsion arrester. This poses a serious problem, because the lineman cannot tell by inspection in the field if the arrester is passing high follow current (or is failing to clear the arc). As a result, trouble-men spend hours and drive miles looking for a burndown or an equipment failure—and find nothing. Valve arresters, on the other hand, pass very little follow current—and don't change their characteristics with age.

Than Expulsion Arresters

by **H. V. DRYER**
Product Section Engineer
Protective Equipment
Line Material Company

Utility companies are frequently baffled by the extensive number of fuse outages following a lightning storm. Links are replaced —but still nobody knows why they blew.

When you compare the operations of valve and expulsion arresters, you may see why so many fuses blow on lines with expulsion arresters, and why, although we make *both* types, we at L-M say that *valve arresters are better than expulsion arresters.* The oscillograms at the left above show typical examples of power follow current through a valve and an expulsion arrester, with 6000 amperes fault current available. The valve arrester draws 35 amperes. The expulsion arrester draws 3100 amperes.

Expulsion Arresters

Therefore with this expulsion arrester, all sectionalizing fuse links must be able to handle 3100 amperes for at least half a cycle. This would require at least a 100 ampere or larger "K" link—which is impractical in many cases. Certainly such fusing gives reduced short-circuit protection and greatly increases the problem of fuse coordination.

The problem is further complicated when, after a few operations, the fibre expulsion tube erodes, and the magnitude of power follow current increases. This operation could eventually cause sectionalizing fuses to blow every time the expulsion arrester operates. This poses a serious problem because the lineman cannot tell by inspection if an expulsion arrester has passed high follow current or has failed to interrupt.

Valve Arresters

Fuse coordination is no problem with valve arresters. They pass only relatively small values of follow current, regardless of system capacity. This is true for the life of the arrester—because of the unchanging characteristics of the valve element. In the rare case of complete failure of a valve arrester, L-M provides further insurance in the form of the "Isolator," which instantly disconnects the ground so that the arrester cannot lock out feeders.

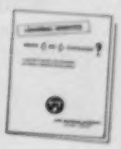
Then Why an Expulsion Arrester?

With all this evidence in favor of valve arresters, you may well ask: "Why did anybody ever make an expulsion arrester in the first place?" The expulsion arrester was created many years ago to satisfy the demands of some operators for an arrester that did not require moisture sealing. Inadequate moisture sealing of early valve arresters was the cause of many failures. Sealing has been perfected and is no longer a problem, as many operators know.

Get Complete Information

Extensive field experience has proven the superiority of the modern valve arrester. Many companies have always used valve arresters, and many others are changing to valve arresters.

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "Valve Versus Expulsion Arresters." Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



MATERIAL Lightning Arresters

H. R. SEARING

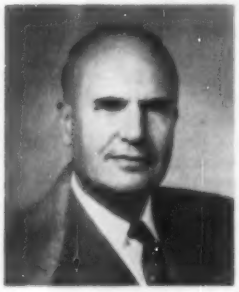
H. C. FORBES

Consolidated Edison Elevates Searing, Forbes

Election of Hudson R. Searing as chairman of the board and of Harland C. Forbes as president has been announced by Consolidated Edison Co of New York, Inc.

Searing, president of the utility since 1949 and chief executive officer since 1953, retains the latter position in his new post. He joined New York Edison Co, a Con Ed predecessor company, 46 years ago, and in 1923 transferred to United Electric Light & Power Co, another Con Edison predecessor, as assistant electrical engineer. Searing later became general distribution manager for both companies. He was advanced to vice president in charge of electric and gas production and operation department in 1939; five years later he was appointed executive vice president.

Forbes has been executive vice president since 1949, an office which has now been discontinued. Prior to joining New York Edison in 1924 as assistant to chief electrical engineer, he was employed by Western Electric Co. After serving as research engineer for four years, he was made system engineer in 1932, and assistant vice president in 1940. Forbes served as vice president in charge of development and planning from 1945 to 1949.



M. H. PRATT

Pratt Elected Niagara Mohawk VP

Niagara Mohawk Power Corp has elected M. H. Pratt as vice president and chief engineer. He succeeds Edwin S. Bundy, who will continue as a director and a vice president in addition to serving as an engineering consultant to the company.

An engineering graduate of University of Pennsylvania, Pratt joined Syracuse Lighting Co, Inc, a Niagara Mohawk system predecessor, in 1926. He was placed in charge of Syracuse district's electrical engineering in 1929, and three years later was made division electrical engineer. Pratt, a Fellow of American Institute of Electrical Engineers, was named chief engineer of the company's central division in 1946.

Hawkins Named VP, Division Head

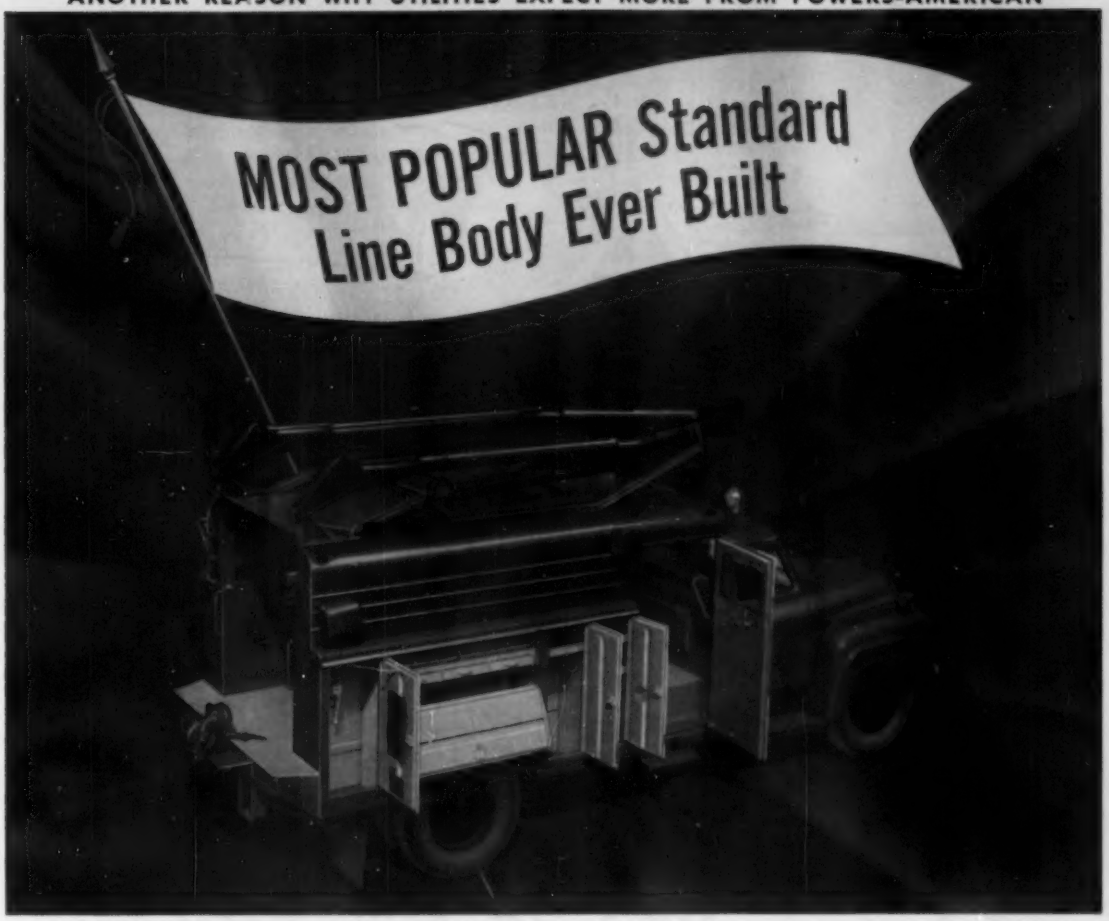
Newly elected vice president of Revere Copper and Brass, Inc, is Eugene P. Hawkins, who has also been appointed executive head of the company's Michigan Division, effective Dec. 1. Division headquarters are in Detroit.

Hawkins, who is former assistant general manager of the Michigan Division, and a mechanical engineering graduate of Washington University, Mo., succeeds Harold N. Todt, who has retired as vice president.

(*More News About People on page* 39)

E. P. HAWKINS

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM POWERS-AMERICAN



POWERS American Series 800-C

LINE CONSTRUCTION AND MAINTENANCE BODY

"Isn't that a custom-made body?" That's what utility men often ask when they see the pace-setting 800-C. And, it's easy to understand why . . . for here's a body with more "most-wanted" features than any *standard* model on the market. Features such as partitioned sliding drawers, extra shelves, extra bins, "full-opening" doors, and 56" wide cargo area . . . just to mention a few.

Crews really go for the 800-C crew compartment—with its easy-riding seats, adequate leg room, and well-ventilated comfort in winter or summer.

Available in lengths of 11', 12' 3", and 13'. . . or without crew enclosure, in 11' and 12' 6" lengths. Can be furnished with any *Pole-Master* Hydraulic Derrick or with conventional derrick equipment.

✦ Descriptive literature and prices will be sent on request

The Series 800-C Body shown here is equipped with a *Pole-Master* PM-2 Hydraulic Derrick . . . one of three different Pole-Master Derricks available in sizes for handling poles from 40' to 75' in length.

Powers-American Division

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR STREET • BERKELEY 10, CALIF.

Adequate Wiring? FIDDLESTICKS!

This is the old Abernathy place. It was the talk of the town when it was built in 1881. People used to come from miles around just to have a look at it.

The old couple that lives here had the place wired for electricity in 1926. If you were to ask them about adequate wiring, they might say "Adequate wiring? Fiddlesticks! All we ever use are the lights in the kitchen and the parlor and a light in the upstairs hall. Reckon we're adequately wired for that!"

They're probably right too...

But chances are, your company doesn't have many customers like this. Many of your customers probably now have or soon will have 100 amp service entrances in their homes. And a 100 amp service entrance is the cornerstone of adequate wiring.

A home equipped with a 100 amp service entrance calls for a 100 amp capacity watthour meter.

J2 Adequate Meters for Adequate Wiring

- **The 100 ampere, slow-speed meter.**
- **Proven by a year's service.**

THE FIRST WATTHOUR METER WITH

STRAIGHT LINE ACCURACY UP TO 100 AMPERES

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

JHSS-8

Linsenmeyer Elected President

J. C. LINSENMEYER

John C. Linsenmeyer, president of American Blower Corp, a division of American Radiator & Standard Sanitary Corp, has also been elected president of the newly formed Ross Heat Exchanger Division of American-Standard.

Other officers of the new division are Richard S. Reade, executive vice president; John W. Gudgel, vice president, sales and marketing; and Townsend Tinker, vice president, engineering, research and development.

PERSONAL BRIEFS

American Institute of Electrical Engineers has elected 13 engineers to the grade of Fellow of the Institute for outstanding achievement in their profession: They are **Martin F. Beavers,** General Electric Co; **William D. Cockrell,** GE; **Alan G. Darling,** GE; **Charles E. Dean,** Hazelton Corp; **W. F. Gakle,** Kuhlman Electric Co; **John T. Hawley,** Sanitary District of Chicago; **Chester I. Hendricks,** design engineer, Texas Electric Service Co; **Louis G. Levoy,** GE; **Howard E. Murphy,** consulting engineer, Cohasset, Mass; **Gordon C. Nonken,** GE; **Raymond J. Salsbury,** Duquesne Light Co; **David B. Smith,** vice president in charge of research, Philco Corp; and **C. P. Stocker,** president and general manager of Loraine Products Corp.

Commission staff changes—Federal Power Commission has appointed **Russell C. Rainwater,** assistant chief of the bureau of rates and gas certificates, as chief accountant, succeeding **Charles W. Smith** who retired . . . In Oklahoma **Ray O. Weems** has resigned as vice chairman of the Corporation Commission, and is succeeded in that post by commissioner **Wilburn Cartwright. Harold Freeman** has been named to fill the vacancy created by Weem's resignation. **Carl B. Mitchell** has been named executive secretary of the commission, succeeding **Tom McMurray,** who also resigned.

Eastern Shore Public Service Co has named **Harry O. Long** plant superintendent for the $17-million power plant now under construction between Millsboro and Dagsboro, Md. He is former engineer at the company's Vienna plant.

Central Louisiana Electric Co, Inc has named **James R. Mann** manager of the DeRidder Division. Replacing him as local manager of the Crowley Division is **Roy J. Gravel.**

Public Service Electric & Gas Co announced the appointment of four general managers to work in the office of **Herbert E. Cliff,** vice president in charge of commercial operations. They are **Spencer A. Moore,** to head sales; **Gordon M. Peterson,** staff operations; **Louis R. Quad,** commercial; and **Bertil P. Dahlstrom,** rates and market research.

Bruce D. Henderson has been appointed vice president and division manager in charge of Westinghouse Electric Corp's Air Conditioning Division, succeeding **H. E. Seim,** vice president of both Air Conditioning and Sturtevant Divisions. Seim continues in the latter position. **John A. Gilbreath,** Staunton plant manager, becomes manager of the division's packaged products department.

Lyle Killingsworth has been elected president of Louisiana Electric Co-operatives, Inc, succeeding **J. Shubel Robbins.**

General Electric Co has named **S. S. Price** and **A. H. Adams** to two newly established engineering posts in the distribution assemblies department. Price has been designated manager of panelboard and motor control; Adams, manager of switchboard and distribution center design engineering.

Square D Co has announced the appointment of **Grant McDonald** as manufacturing manager and **Anthony Kasper** as controller of the company's Distribution Equipment Division.

Joseph J. Peltz was recently elected a director of United States Hoffman Machinery Corp. He has been president of Hoffman Machinery Credit Corp, a subsidiary, since last February.

R. J. Sargent, manager of major appliances, has been appointed general manager of Westinghouse Electric Corp's newly created Major Appliance Division.

Fairbanks, Morse & Co has named **Henry J. Barbour** manager of advertising and public relations. He succeeds **L. A. Harlow** who has resigned.

Harry W. Carloss, customer service director of Kentucky Utilities Co, has been elected president of Kentucky Inter-Industry Farm Electric Council.

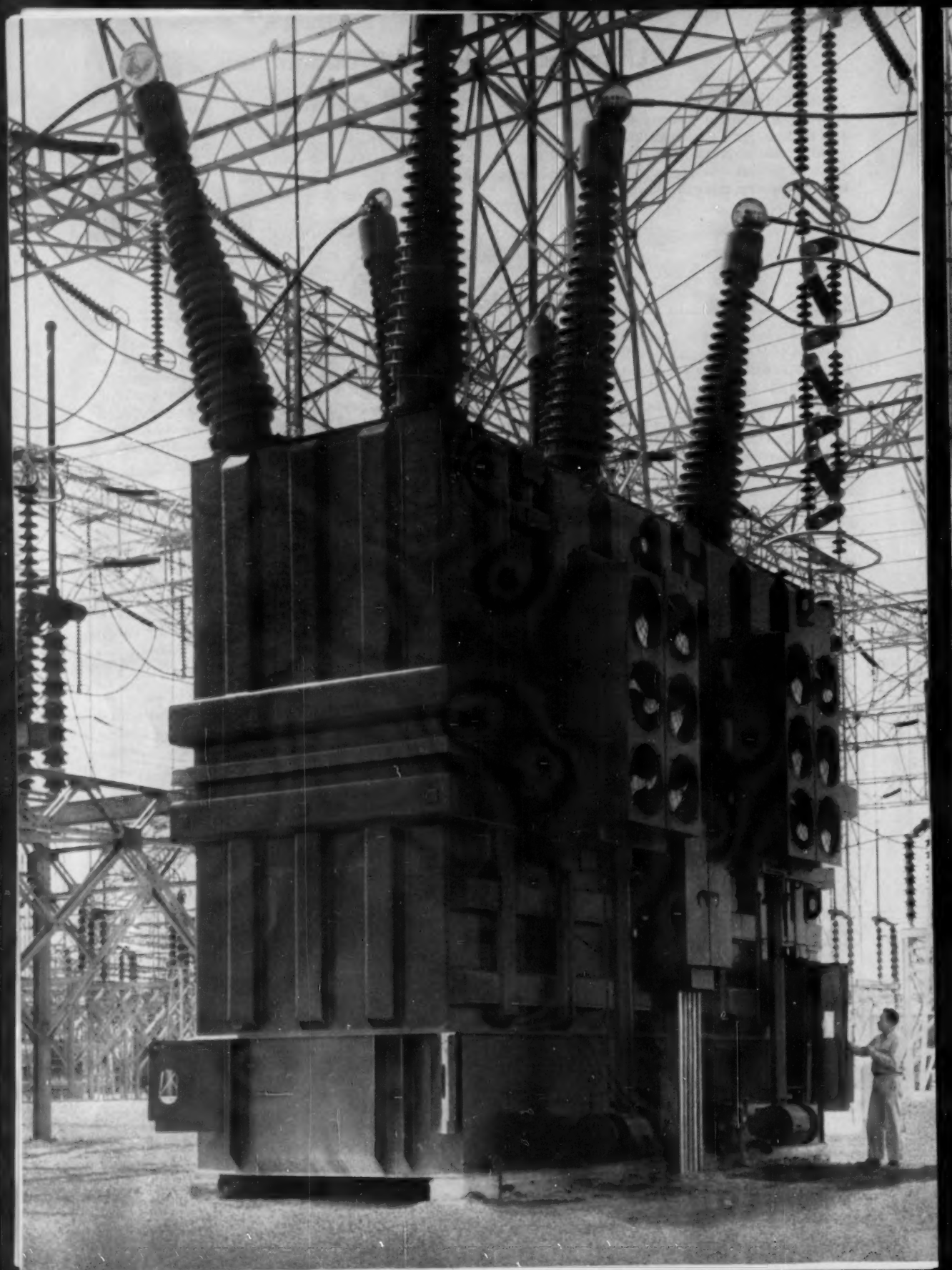
Frank Reinhold Named CL&P Vice President

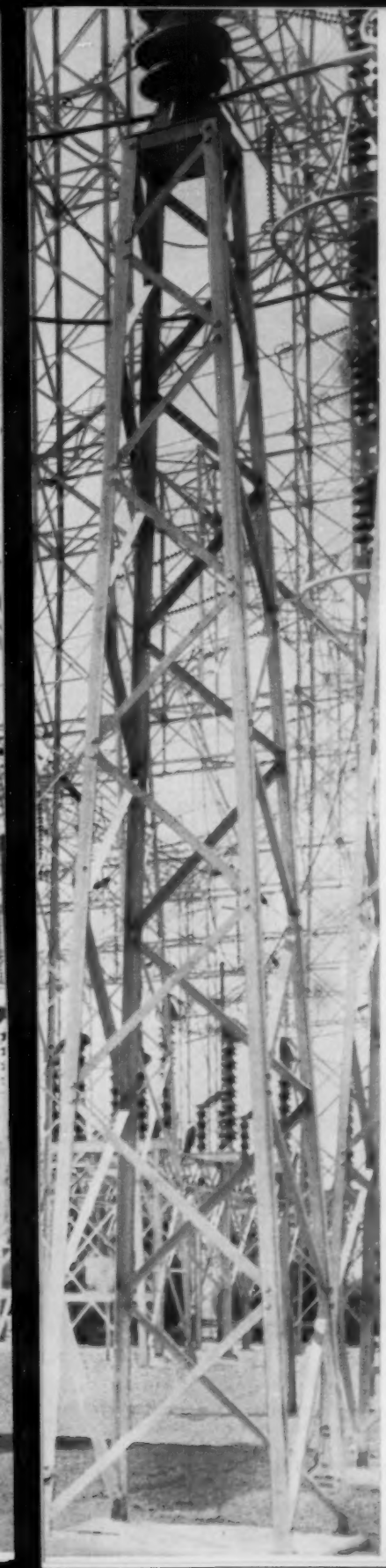
Frank M. Reinhold, purchasing agent of Connecticut Light & Power Co, has been elected a vice president, with headquarters at Berlin.

He began his career in the utility field in 1923 when he joined CL&P's engineering department in Waterbury. After serving in various capacities, he was appointed assistant purchasing agent in 1933. He was promoted to purchasing agent in 1946, and will continue in charge of purchasing.

OBITUARY

Herbert Benjamin Pierce, 68, retired vice president of International General Electric Co, died in New York. Pierce, who retired in 1952 after 34 years with the company, spent 20 years in Europe and the Far East, and helped in the development of power plants and transmission lines in Japan and Formosa after World War II.





World's largest at 400,000 kva...

greatest transformer capacity ever applied to a transmission system

News was made recently with the installation of the world's largest autotransformer at the Tanners Creek plant of the Indiana & Michigan Electric Co., Lawrenceburg, Indiana. This 330-kv unit and another identical twin, both built by Westinghouse, are the only transformers of this enormous capacity ever operated on a transmission system.

One glance will show you the giant proportions of this transformer compared with the man in the foreground—33 feet high from base to bushing tip, 30 feet long, 16 feet wide, and weighing 574,000 pounds oil-filled. Despite the literal immensity of the transformer, it is the Westinghouse Form-Fit design with forced-oil cooling which made it practical to construct and ship this 3-phase unit—a new achievement in power conversion for the electric utility industry.

With the development of this new capability in transformers, it is still a fact that Westinghouse Form-Fit transformer design provides minimum bulk consistent with low losses, offering you maximum year-in and year-out operating economy and over-all performance you can depend on.

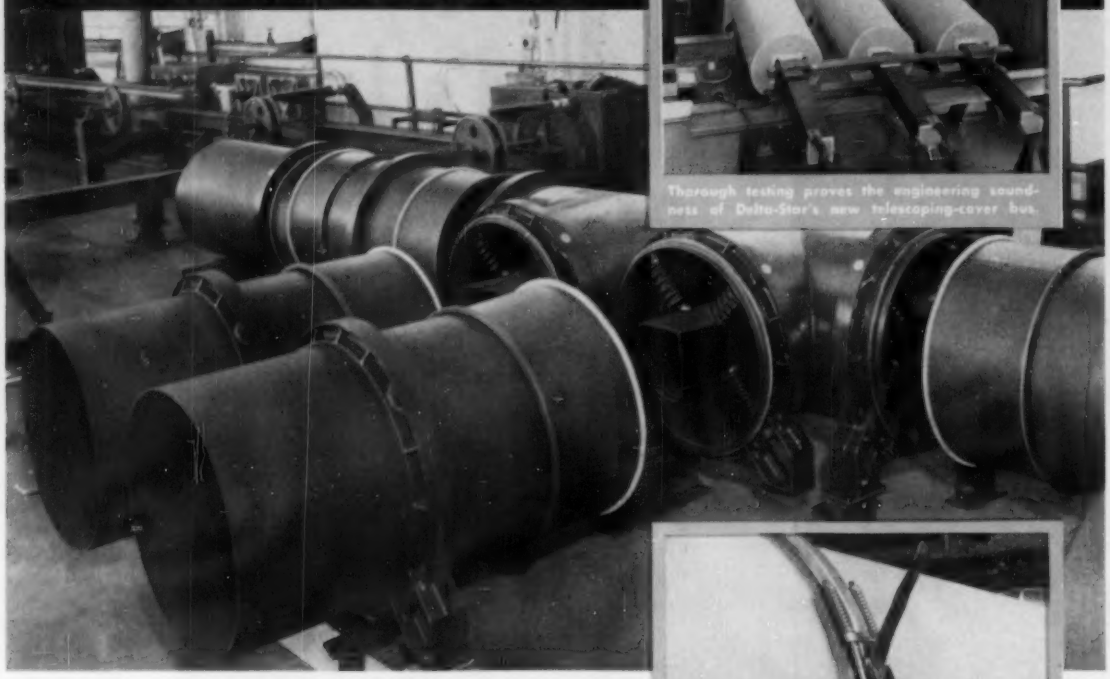
For more particulars, get in touch with your Westinghouse Sales Engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70756

The greatest concentration of power conversion equipment ever applied to a 330-kv system is shown here at the Tanners Creek plant of the Indiana & Michigan Electric Co.

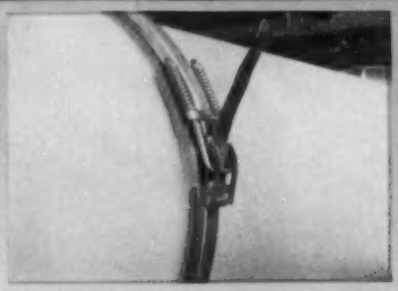
YOU CAN BE SURE...IF IT'S

Westinghouse

Here's Delta-Star's new, improved metal enclosed, isolated phase bus with telescoping covers, ready for shipment.



Thorough testing proves the engineering soundness of Delta-Star's new telescoping-cover bus.



Closeup of telescoping-cover clamping ring with toggle opened. Cover slides back, exposing 2½ ft. bus area. Saves time and money on inspection and maintenance.

Clamping rings securely locked and bolted in position. Spring pressure and circular gaskets maintain tight seal. Use of circular gaskets reduces gasketing by 50%.

Lower costs—install new DELTA-STAR isolated phase bus with Telescoping Covers

Simplified installation and time and money-saving maintenance readily explain the popularity of Delta-Star's new metal enclosed, isolated phase bus.

Installation is simplified by eliminating bolted covers. Longitudinal sections 6 to 8 ft. long are pre-assembled and shipped in lengths as large as your facilities can handle. Telescoping covers are clamped into position and locked with two screws. There are no longitudinal gaskets to install.

Inspection and maintenance is quick and easy. Simply unlock the telescoping covers and slide them back. Spring loaded clamping assures air-tight seal against elements, moisture and dust.

There's no question about cutting installation and maintenance costs when you install the new Delta-Star telescoping-cover isolated phase bus. Investigate soon.

For the best in high voltage electrical equipment—specify DELTA-STAR

DELTA-STAR ELECTRIC DIVISION

HKP

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

MEETINGS CALENDAR

An extended list of coming meetings appears in the last issue of each month

DECEMBER

AMERICAN WATERSHED COUNCIL, INC—Second National Watershed Congress, Statler Hotel, Washington, D. C., Dec. 5-6.

EDISON ELECTRIC INSTITUTE—Commercial Sales Group Electric Space & Air Conditioning Committee, Terrace Plaza Hotel, Cincinnati, Dec. 5-6; Commercial Sales Group Street Lighting Committee, Indianapolis, Dec. 6-7; Commercial Sales Group Cooking & Water Heating Committee, Hotel Statler, Boston, Dec. 7-9; Customer Accounting Committee, sponsored jointly with American Gas Association, Henry Grady Hotel, Atlanta, Ga., Dec. 8-9; Industrial Relations Committee, EEI Headquarters, New York, Dec. 15.

INTERNATIONAL EXPOSITION—25th Exposition of Chemical Industries, Convention Hall, Philadelphia, Pa., Dec. 5-9.

ELECTRIC COMPANIES ADVERTISING PROGRAM—Copy Group Meeting, Drake Hotel, Chicago, Ill., Dec. 7.

NATIONAL ASSOCIATION OF MANUFACTURERS—60th Congress of American Industry, Waldorf-Astoria, New York City, Dec. 7-9.

ENGINEERS JOINT COUNCIL—Nuclear Engineering & Science Congress, Public Auditorium, Cleveland, Dec. 12-16.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Steering Committee, Biltmore Hotel, New York, Dec. 13.

JANUARY 1956

WEED SOCIETY OF AMERICA—Charter Meeting, Hotel New Yorker, New York City, Jan. 4-5; Northeastern Weed Control Conference, Annual Meeting, Hotel New Yorker, N. Y., Jan. 6.

EDISON ELECTRIC INSTITUTE—Financing & Investor Relations Committee, Hotel Biltmore, New York, Jan. 19; Industrial Relations Committee, EEI Headquarters, New York, Jan. 19; Prime Movers Committee, Warwick Hotel, Philadelphia, Jan. 30-Feb. 1.

OKLAHOMA UTILITIES ASSOCIATION—Accounting Section, Alvin Hotel, Tulsa, Okla., Jan. 20.

AMERICAN SOCIETY HEATING & AIR CONDITIONING ENGINEERS—Annual Meeting, Cincinnati, Jan. 23-25.

NATIONAL RURAL ELECTRIC COOPERATIVE—14th Annual Meeting, St. Louis, Jan. 23-26.

* **DOBLE ENGINEERING CO**—23rd Annual Conference of Doble Clients, Sheraton Plaza Hotel, Boston, Jan. 23-27.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Fairmount Hotel, San Francisco, Jan. 24-27.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Winter General Meeting, Hotel Statler, New York, Jan. 30-Feb. 3.

FEBRUARY

EDISON ELECTRIC INSTITUTE—Conference Planning, sponsored jointly with AGA, William Penn Hotel, Pittsburgh, Feb. 2-3; Transmission & Distribution Committee, Warwick Hotel, Philadelphia, Feb. 7-8; Electrical Equipment Committee, Homestead, Hot Springs, Va., Feb. 13-14; Commercial Lighting Committee, Hotel Shoreham, Washington, D. C., Feb. 15-16; Meter & Service Committee, Hotel Cleveland, Cleveland, Feb. 20-22.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Industrial & Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 2-3.

INDUSTRIAL ELECTRIFICATION COUNCIL—National Industrial Electric Heating Conference, Netherland Plaza Hotel, Cincinnati, Feb. 6-10.

* **PENNSYLVANIA ELECTRIC ASSOCIATION**—Relay Committee, Benjamin Franklin Hotel, Philadelphia, Feb. 9-10; Electrical Engineering Committee, Penn Harris Hotel, Harrisburg, Pa., Feb. 9-10; Systems Operation Committee, Hotel Statler, N. Y., Feb. 16-17.

SOUTHEASTERN ELECTRIC EXCHANGE—Personnel Administration Section, Buena Vista Hotel, Biloxi, Miss., Feb. 9-10.

ROCHESTER ELECTRICAL EXPOSITION—War Memorial Building, Feb. 18-25.

NATIONAL ADEQUATE WIRING BUREAU—12th Annual Conference, LaSalle Hotel, Chicago, Feb. 23-24.

AMERICAN SOCIETY FOR TESTING MATERIALS—Committee Week, Hotel Statler, Buffalo, Feb. 27-March 2.

MARCH

SOUTHEASTERN ELECTRIC EXCHANGE—23rd Annual Conference, Boca Raton, Fla., March 12-14.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—12th Annual Conference, Hotel Statler, New York City, March 12-16.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Edgewater Beach Hotel, Chicago, March 12-16.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Spring Meeting, Multonomah Hotel, Portland, Ore., March 18-21.

ILLINOIS INSTITUTE OF TECHNOLOGY—18th Annual American Power Conference, Hotel Sherman, Chicago, March 21-23.

OKLAHOMA UTILITIES ASSOCIATION—Annual Convention, Biltmore Hotel, Oklahoma City, March 22-23.

PACIFIC COAST ELECTRICAL ASSOCIATION—Engineering & Operating Section, Palace Sheraton, San Francisco, March 22-23.

APRIL

ELECTRICAL MAINTENANCE ENGINEERS ASSOCIATION—8th National Biennial Electric Industry Show, Shrine Exposition Hall, Los Angeles, Calif., April 5-7.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operation Section, Bon Air Hotel, Augusta, Ga., April 12-13.

EDISON ELECTRIC INSTITUTE—National Conference of Electric & Gas Utility Accountants, sponsored jointly with AGA, Hotel Commodore, New York, April 16-18; Accident Prevention Committee, Sheraton Hotel, St. Louis, April 30-May 2.

GREATER NEW YORK SAFETY COUNCIL—26th Annual Safety Convention & Exposition, Hotel Statler, New York City, April 16-20.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Engineering Conference, Hotel President, Kansas City, Mo., April 18-20.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—2nd Conference on Recording & Controlling Instruments, Bradford Hotel, Boston, April 26-27.

* Additions this week.

Fluid Coke Promising

(*Continued from page* 27)

absence of a slag screen in No. 1 Boiler seems to have contributed to the better combustion conditions experienced.

It appears that the percent of volatile matter in the coke burned in No. 1 Boiler was in general higher than that burned in No. 26 Boiler. The volatile matter ranged from 6 to 8% for the No. 26 Boiler tests; whereas it ranged from 7 to 14% for No. 1 Boiler tests.

In all tests at this station it was necessary to maintain an auxiliary fuel flame at each coke burner to insure proper combustion. When the auxiliary fuel was removed from the burner, the ignition point of the coke moved well out into the furnace. In some cases it was impossible to tell where ignition was taking place even though there was no apparent change in the appearance of the furnace in the area above the flame. Insufficient quantities of coke were burned at Essex Station to determine the effect of coke firing on boiler maintenance.

These tests showed that electrostatic precipitators will function properly when handling fluid coke. Other large-scale tests indicated mechanical precipitators are somewhat more efficient handling fluid coke refuse than when handling flyash.

In addition to the Public Service work, other combustion tests were run by Babcock & Wilcox Co and the Riley Stoker Corp. Test work is presently being conducted at the Oleum Plant of the Pacific Gas & Electric Co.

Pumped Hydro Backs British Grid

SYSTEM ENGINEERING
Planning

Pumping water to Wales in off-peak periods for return through 300-Mw turbines offers economics over more coal-fired plants

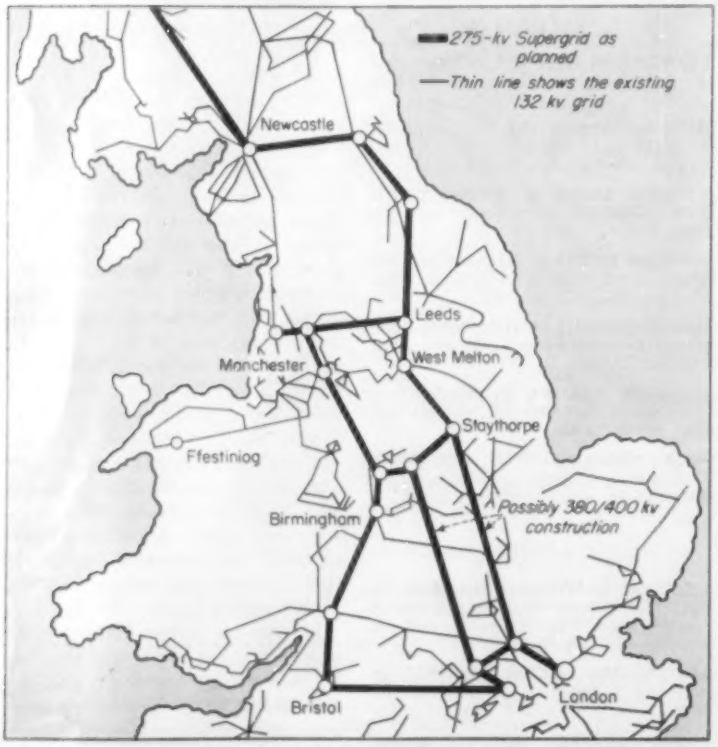
A 300-Mw pumped hydroelectric storage scheme will be built in North Wales by the Central Electricity Authority to expand Great Britain's basic electric power supply. CEA's plan is to employ available power during off-load hours to pump water to the required elevation for later return through hydro generators.

CEA prefers the hydroelectric project to costly additions to thermal capacity, especially as any additional thermal capacity built to meet peak demand would remain idle during off-peak hours.

The impending advent of wide-scale nuclear power is probably another factor in CEA's decision. This program is due to start in earnest within two years, and construction has already begun on some 200 Mw of installed atomic power as a byproduct of Britain's plutonium production program. Pumped hydro storage is just the thing for the earlier atomic power stations.

Another consideration is Britain's net deficit in coal, with imports running over $1-million a month. If this hydro scheme, along with others that may follow, can save the building of more coal-fired thermal plants, Britain's balance of payments will be that much aided.

Nuclear power plants now have an extremely high initial capital cost, ranging upward from $300 per kw of installed capacity. But their fuel costs are low. Accordingly, the most equitable system would be to keep nuclear plants running at near-full capacity, say 80%, either as base load plants or as suppliers of power for hydro storage water pumping. CEA's investigations indicate that such a scheme would be very economical apart from atomic power or Britain's chronic coal shortage.



FFESTINIOG, WALES, HYDRO PROJECT SITE, WILL TIE INTO CEA POWER GRID

Has 11.4% Load Factor

Average annual output of the hydro scheme will be 300-million kwhr. The initial capital cost, including necessary transmission lines, has been set at $40.5-million which is $30-million less than a modern thermal plant of equivalent capacity. CEA has estimated that the project will cost $600,000 a year less to produce the additional power than conventional thermal plants when amortization, operation, maintenance, and fuel are considered. CEA figures put the regeneration efficiency (units sent out compared to units required for pumping) at 66.6%.

Obviously the primary duty of this installation will be to serve as a peak-load station. Its 300-million kwhr annual output will correspond to a load factor of 11.4%.

Supergrid Favors Scheme

The 275-kv supergrid system now being installed in Britain influenced the CEA's decision favoring the water storage scheme. Without the grid's long-distance transfers of large blocks of power, the project would not have been practical.

Of the six sites considered for this project, the one decided upon was Ffestiniog, near the mining town of Blaenau Ffestiniog, Merionethshire, North Wales. There two reservoir sites are less than a mile apart with an altitude difference greater than 1,000 ft. The upper reservoir will be formed by enlarging an existing lake, Llyn Stwlan, by erection of a massive buttress dam 90 ft high and 900 ft long.

Capacity 60-Million Cu Ft

The lower reservoir will be made by a dam 90 ft high and 1,800 ft long across the valley of Afon Ystredeau. The two reservoirs will be connected by a vertical shaft tunnel and a short length of surface pipe line. The power-pumping plant will be on the western shore of the lower reservoir. Each

(*Continued on page* 46)

W. L. McKeithan, Section Manager, Distribution Transformer Engineering, reveals this

FACT: New pole-type units have low weight where it counts

WEIGHT REDUCTION IN HIGHER RATED TRANSFORMERS			
	75 kva 2400v	100 kva 2400v	167 kva 2400v
Old Weight	1180	1395	2015
New Weight	975	1130	1475
Per Cent Reduction	**17%**	**19%**	**26%**

The new Westinghouse pole-type distribution transformers—75, 100, 167 kva—have been drastically reduced in weight. The 167-kva unit now permits direct pole mounting—and conforms to EEI-NEMA 6th Report Standards. This means easier installation and, quite often, saves change-out to a larger, more expensive pole. Example: 167 kva, 7620 to 120/240 . . . reduced from 2600 pounds to 1515 pounds.

Get more for your transformer dollar—and simplify operating problems—with the new Westinghouse designs.

• • •

Call The Man With The Facts, your Westinghouse Sales Engineer. Or write direct to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-70740

YOU CAN BE **SURE**... IF IT'S

Westinghouse

Pumped Hydro Backs

(*Continued from page* 44)

reservoir will have a storage capacity of 60-million cu ft, enough to maintain full load generating capacity for about four hours daily.

Initially the plant will be used most during the three to four months peak load period in the winter, although exceptional requirements at other times may call for its operation as a generating plant. Most pumping will be carried out between midnight and 7 AM daily, Monday through Friday, but some pumping may be in operation at the off-load period between morning and afternoon peaks.

Units Can Be Switched

It is quite possible that as the power and coal shortages grow, this plant will be used more and more, running to the full-time peak of its generating capacity throughout the year, rather than only in the winter.

Maximum pumping capacity, amounting to about 260 Mw, will be supplied by encroaching on the normal running reserve of coal-fired plant. Pumping can be stopped immediately at any time, and units switched over to generation. The only limiting factor would be the amount of water stored.

The plant will be switched at 275 kv and connected into CEA's grid system by means of a double-circuit 275-kv transmission line to Carrington, near Manchester, with a tapping at Harwarden to reinforce the North Wales system.

Six 50-Mw Units Planned

While details of the plant have not yet been finalized, it is probable that six 50-Mw units will be installed. Choice between separate pumps and turbines, and dual-purpose pump-turbines has yet to be made. In either case CEA intends to use a single-shaft system. Another choice must still be made between horizontal and vertical shafts.

"Owing to the impossibility of accurate long-term forecasting," CEA said in appraising the scheme, "calculations have been based on the conditions which are expected to apply in the early years of the scheme.

Advantages to Improve

"Since the alternative coal-fired plant would produce its maximum benefit initially when operating at a high load factor, any advantage shown for the pumped storage scheme at this stage can be expected to increase year by year, particularly as the efficiency at which the pumping energy is produced will increase as the generating efficiency of the whole system increases."

Much of the saving in the cost of power production is because of the substantially lower capital charges on the installation, heavy proportion of civil engineering work, and longer life of the plant (as compared with coal-fired thermal units). An additional saving will be obtained through the reduction in fuel consumption of plant which would otherwise have to be held in "hot" reserve.

POWER BRIEFS

● California Electric Power Co has applied to the State Public Utilities Commission for authority to build a $34-million, 240,000-kw steam plant near San Bernardino. The first 60,000-kw unit is scheduled for operation in July, 1957, at an estimated cost of $9.7 million, including land.

● Generator contract for Consolidated Edison Co of New York's new $69-million, 330,000-kw Arthur Kill station (EW Oct. 31, page 44) has been awarded to General Electric Co. Boiler contract goes to Babcock and Wilcox Co. Unit will be a duplicate of the company's Astoria No. 3 unit.

● Pacific Gas & Electric Co has been authorized to build six hydro projects totaling 528,000 kw at a cost of $149 million by the State Public Utilities Commission. Capacity of three Feather River projects—Butt Valley, Caribou No. 2, and Belden—will total 252,000 kw, and cost $70 million. Two new plants, Haas and Kings River, and enlargement of the Balch plant, all in Kings River Basin, will cost $79 million and provide total generation of 276,000 kw.

Mexican Firm Buys Mobile Power Unit

A 1,000-kw, rail-mounted, diesel-electric generating unit has been purchased by Celanese Mexicana, S. A., an affiliate of Celanese Corp of America, to supply additional power when needed for its plants throughout Mexico.

Home base for the mobile unit is the company's acetate-filament and staple-fiber plant at Ocotlan, Jalisco, where production was seriously curtailed last spring because of a drought-provoked power shortage. The unit is the same one displayed at General Motor Corp's Powerama show held recently in Chicago.

● Southern California Edison Co, due to the unabated increase in residential building and industrial expansion in its area, has made an upward revision of estimated plant expenditures for 1955, from approximately $76 million contemplated at the beginning of the year to a present expectation of about $92.7 million.

● Baltimore Gas & Electric Co has ordered a second generating unit to be installed at the Herbert A. Wagner Station. Scheduled for operation early in 1959, the new 125,000-kw unit, together with its housing, boiler, and auxiliaries will cost over $21 million. It will be similar to the unit now being installed for completion early in 1956.

LOOK...

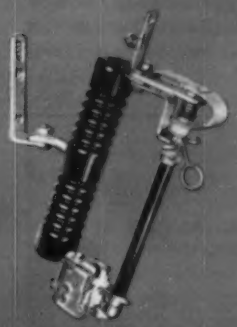
Now You Can Use Lower Voltage Distribution Cutouts on Your System

Nominal Voltage of System, Kv	Nominal Voltage Rating of Cutout, Kv		
	A	B	C
2.4	7.5	7.5	7.5
2.4/4.16 Gr Y	7.5	7.5	7.5
4.8	7.5	7.5	7.5
4.8/8.32 Gr Y	7.5	7.5	15
7.2	7.5	7.5	7.5
7.2/12.47 Gr Y	7.5	7.5	15
7.62/13.2 Gr Y	7.5	7.5	15
12	15	15	15
13.2	15	15	15
14.4	15	15	15
14.4/24.9 Gr Y	15	23	23
23	23	23	23
34.5	34.5	34.5	34.5

A Single-phase distribution transformer applications

B Three-phase applications at distribution transformers, pole top capacitor banks, and line sectionalizing points.

C Three-phase applications in distribution substations.



Type XS Cutout
Single Shot, Bird-proof

Here is the CUTOUT that makes real savings possible . . . and a table to help you apply it

The use of higher voltage distribution systems, and the accompanying rise in equipment costs, have brought cutout application under closer examination. To help you, S&C provides this new table of voltage application recommendations, which shows that at certain system voltages Type XS Cutouts can provide protection at lower cost.

The extended-range protection provided by the Type XS Cutout results from two design features: (1) a powerful high-speed "flipper" to whip out the fuse link cable, and (2) extremely high insulation values.

When the fuse link melts, the flipper at the bottom of the fuse tube operates at high speed—independent of the dropout action of the tube. Therefore, the XS easily interrupts even the lowest fault currents, in spite of voltages which may exceed the maximum design voltage of the device.

From the standpoint of insulation, you will find it easy to match the XS to your system insulation levels, since complete data on the insulation characteristics are tabulated in Catalog Section 511. You will see that the XS far exceeds other cutouts.

Write for Catalog Section 511 and new Data Sheet 639, and see how Type XS Cutouts can reduce protection costs on your distribution system.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

Executives Get Atomized

MANAGEMENT
Industrial Relations

Primer for management sponsored by National Industrial Conference Board brings executives up to date on the uses of the atom

Even executives must go back to school in this Atomic Age. Recently 69 of the nation's business and industrial leaders found themselves in class learning the A, B, C's of nuclear energy. For six days these men listened to some of the country's top nuclear experts expound on all aspects of this new field in a course for management sponsored by the National Industrial Conference Board.

The course was held at the secluded Westchester Country Club, Rye, N. Y., so that the pressure of business activity found in the city would not distract the "pupils."

About 17 of the course participants were from the utility industry or directly connected with it. The remainder were chiefly from the manufacturing or financial industry. Three were from foreign countries, two of these came from Japan and one came from Spain.

Classes started promptly at 9 AM (sometimes earlier) and usually lasted till 9 PM. Aside from breaks for meals the executives were kept busy on the work of the course.

Purpose of the course was to acquaint management with the fundamentals of nuclear energy and to show them how it can be used, not only in the power fields but also in the fields

CURRICULUM

Monday, Fundamentals of Atomic Energy
- Fundamentals of Reactor Design
- Reactor Components and Metallurgical Problems
- Raw Materials — Ores And Processing
- Nuclear Fuels

Tuesday, Safety and Reactor Operations
- Reactor Hazards Evaluation
- Visit to Brookhaven National Laboratory

Wednesday, The Insurance Problem
- Waste Disposal
- Production and Use of Radioisotopes
- How to Use Radioisotopes in Industrial Research

Thursday, How to Use Radioisotopes in Production Activities
- Radiation and Food Preservation
- Use of Gross Fission Products to Initiate Chemical Reactions
- Outlook for Investments in Atomic Energy
- International Developments in Atomic Energy
- Radiation Damage
- The Atomic Locomotive

Friday, Personnel Problems
- How to Solve Public and Employee Relations Problems
- Engineering and Construction Problems of a Nuclear Plant
- Report on Nuclear Power Programs
- Research and Package Reactors
- Atomic Power Market in the U.S. and Overseas

Saturday, New Law and Its Meaning to Industry
- Business Potentials in Atomic Power
- Economics of Commercial Nuclear Power

of medicine, agriculture, and manufacturing. Course of instruction was thorough (see box p 48). Although the participant did not graduate as a nuclear physicist, he did, as one of the executives put it, "at least now speak the same language as the nuclear physicist and engineer." In addition to theory and application such things as business potentials, personnel problems, insurance, and legal aspects were discussed.

The faculty included top men from both industry and the Atomic Energy Commission. Several members of the Conference Board also served as lecturers. All were experts in their specialized fields. Dr Marvin Fox, chairman of the Reactor Department at Brookhaven National Laboratory, acted as course moderator.

Instruction Methods Varied

All conceivable methods of instruction were used. There were formal lectures, small informal bull sessions, slides, movies, and actual demonstrations. Control rod mechanisms, radiation instruments, and reactor models were among the displays. A trip to the Brookhaven National Laboratory was included.

Several times during the week tests were given to see if the participants were absorbing the material. If there was an unusually large number of wrong answers to any question, the material with which that question was concerned would be covered in one of the informal bull sessions.

Special Notebook Supplied

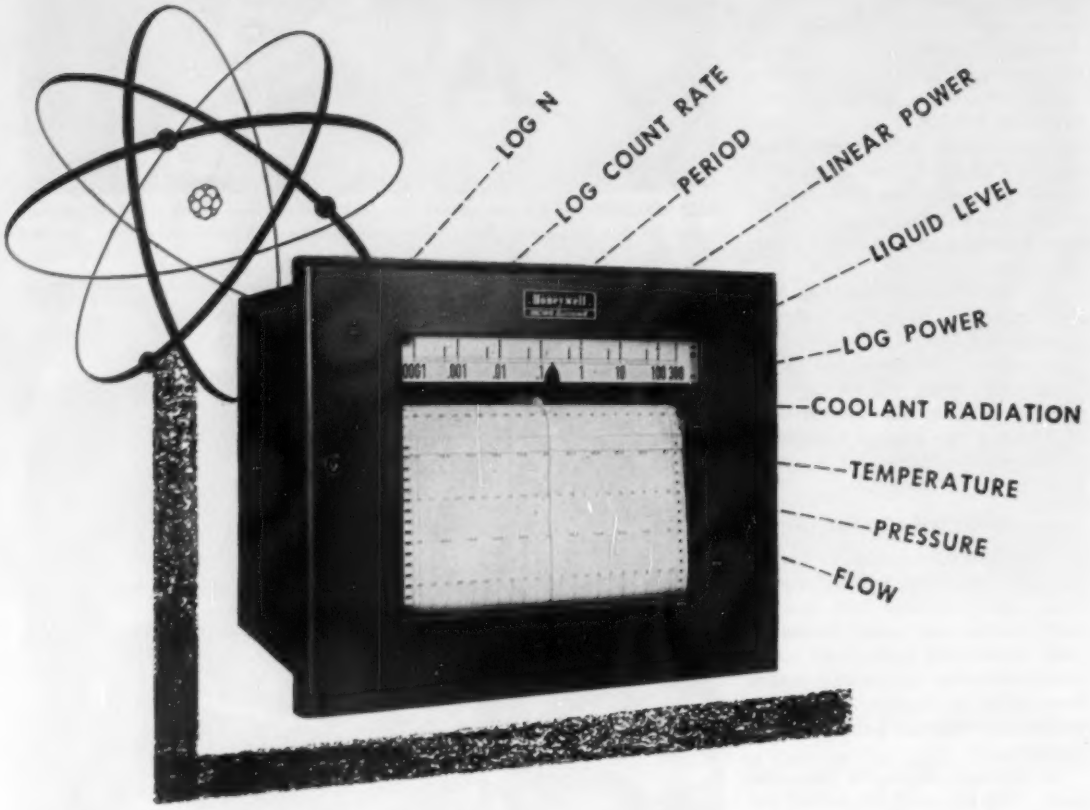
Each person was given a course notebook which contained an outline of the lectures and source material pertaining to the lectures together with several pertinent references to the material under discussion. From time to time during the course the notebook was supplemented with such things as some of the outstanding papers from the recent Geneva International Atomic Conference.

Did the executives think it was worthwhile? All opinions seemed to be in the affirmative although some thought more time should have been spent on the fundamentals. Did the executives think they had worked hard? This can best be answered by the comment of one bank president who said, "I'm going to shoot the first person who asks me how I enjoyed my vacation at the country club when I return to my office next week."

BULL SESSIONS led by one of the course lecturers gave participants an opportunity to get additional information on material covered in formal lectures

SCIENTISTS AT Brookhaven Laboratory demonstrate hot cell apparatus to visiting executives. The executives also saw the research reactor and the synchrotron

EXAMINATIONS during the course gave the lecturers an idea of how they were getting their material across. No one returned home with a bad report card



Complete, job-fitted instrumentation for *all* nuclear reactor measurements

WHETHER you are working with nuclear reactors for power generation, basic experimentation or classified projects, you'll find it advantageous to bring your measurement and control problems to Honeywell.

You'll profit by Honeywell's complete line. In cooperation with physicists and engineers, a wide range of specialized instruments has been developed for measuring and controlling the critical variables encountered in reactor operation. Log count rate, period, temperatures, linear power, log power, coolant radiation and many other variables have been included in the scope of this line of instruments. For servo systems, Brown converters, amplifiers and motors offer the solution to numerous special problems.

You'll profit by Honeywell's experience. A staff of top flight engineers who have served the nucleonics field, ever since the first self-sustaining reactor was demonstrated, gives your application thoroughly competent, individualized study. They are familiar with the latest developments in reactor operation . . . have devised integrated systems for start-up, excess power level protection and operating power control for all types of reactors currently in use. And they are well qualified to work with you on new instrumentation techniques for projects still in the laboratory stage.

For a discussion of your specific problems, call your local Honeywell field engineer—as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Make people feel important . . .

Pronounce names correctly . . .

Smile . . . All help . . .

Make Human Relations, Public Relations

The way to get along successfully with other people is by first attaining "self-knowledge." Utah Power & Light Co has incorporated this belief into its current employee training program in an attempt to foster better public relations from contacts between employees and the public. To present this current phase of a training program that has run for 26 years, company has retained H. Ward McCarthy, a human relations consultant.

The program consists of lectures given to small groups of employees from all departments. These meetings are followed by sound-slide film talks by members of the supervisory staff. Discussions led by McCarthy are designed to get the employee to understand what he is, to feel that he is important to himself and the company, to see how his actions affect others, and to know how he exists in relation to other people.

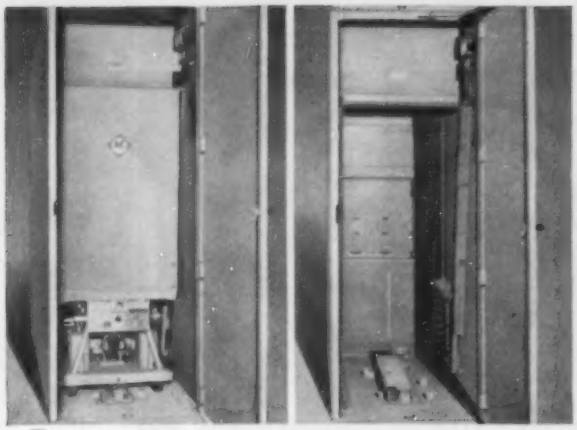
The scope of the program is shown by the titles of some of the talks: Basic Urges that Make Us Tick, Some Quick Tricks for Personal Development, and The Bigness of Little Things. Typical of the direct approach used is a presentation of six points in developing a positive personality. As McCarthy points out, these are:

1. Make people feel important and do it sincerely.
2. Be a good listener, as difficult as this may be.
3. Talk in terms of the other fellow's interest.
4. Become genuinely interested in other people.
5. Smile.
6. Remember, a man's name pronounced correctly is the sweetest sound in the English language.

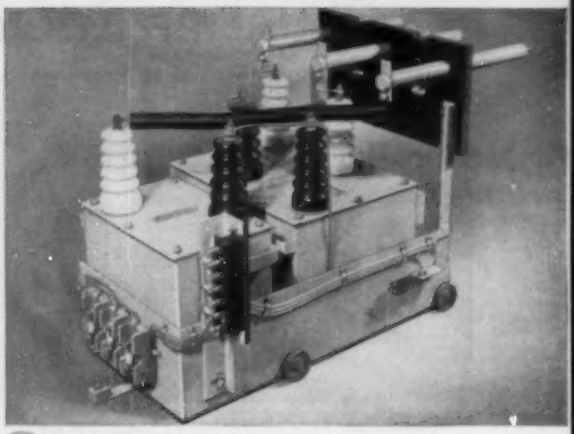
Commenting on the art of being a good listener, McCarthy tells the Utah P&L employees, "Now, you know you're not going to listen long to a fella that can speak only in terms of I...I...I!" In back of all the discussions is the belief that public relations can be controlled only if a company has well established human relations. Public opinion cannot be controlled merely by repeating continuously that the company is doing a good job and benefiting the community. It is also stressed that the employee is the show case by which the company is judged.

McCarthy presents these guides for improving public relations. First, find out what is being done that the public does not like and stop doing it. Practice the golden rule with sincerity. In the last analysis, human relations become public relations when placed on the basis of how other people view us.

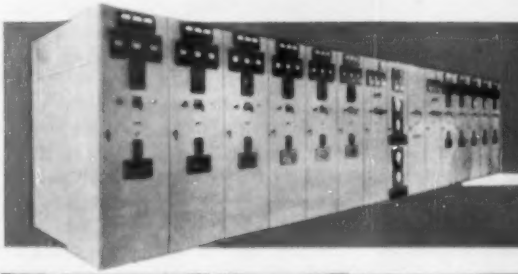
EMPLOYEES ARE THE SHOW CASE by which a utility company is judged, human relations consultant H. W. McCarthy tells Utah Power & Light Co employees during current training program. Better public relations is the object of the course



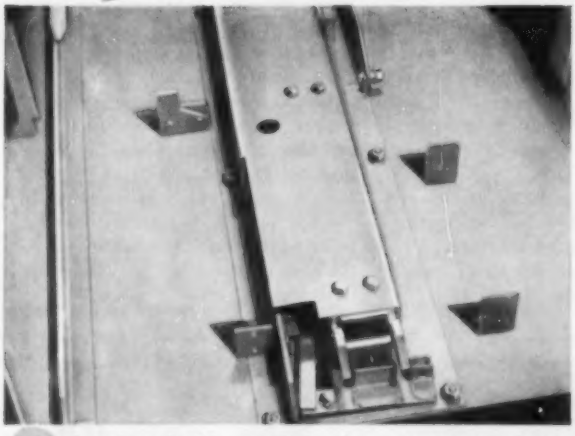
Personnel Safety — Steel front panel protects operating personnel even if door of cubicle is open. Hinged steel panel on front of breaker rests against gasketing on fixed portion to provide a completely sealed barrier between breaker compartment and operator.



Safer Auxiliaries—Potential transformers on draw-out carriage provide safe inspection, replacement of current-limiting fuses or transformers. Opening compartment door automatically disconnects both primary and secondary.



ALLIS-CHALMERS Switchgear

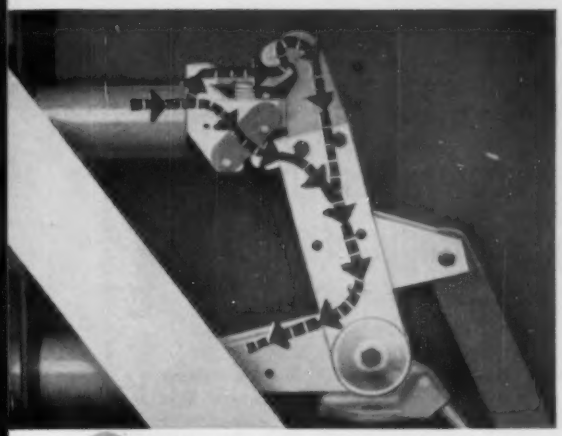


Complete Interlocking — (1) Breaker cannot be moved into or out of connected position when closed. (2) With breaker in connected position, opening pivoted cover over drive screw head trips breaker. (3) Cover over drive screw head can be padlocked holding breaker in any position of travel.

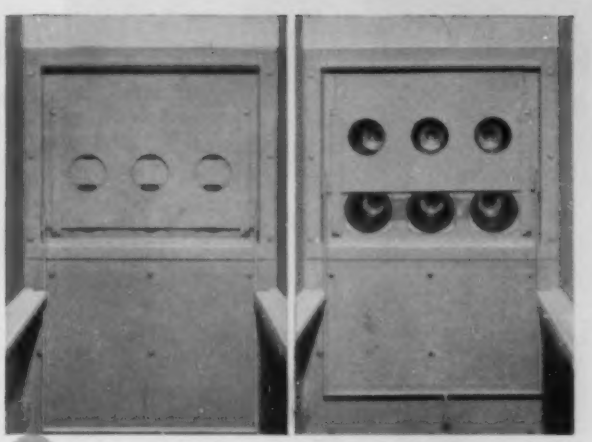
Expansion Bus Joint — Construction allows expansion or contraction of bus due to variation in temperature. This prevents stresses on structure and components. Slotted bolt holes, spring washers, and bus joint insulation that eliminates compounds are used.

A-C ALLIS-CHALMERS

ALLIS-



Electrical Reliability — Current in loop formed by incoming and outgoing studs and movable contact arm sets up magnetic force pushing contacts closed. Even after main contact opens, magnetic forces maintain high pressure contact on arcing contacts.



Primary Circuit Isolation — Automatic shutters cover stationary primary disconnects when breaker is in disconnect or *test positions.* Action of shutters is positive. Instead of depending on gravity, the shutters are closed as well as opened by mechanical force obtained from breaker positioning mechanism.

—Safe...Reliable

Extra Value Features for Users of Allis-Chalmers Metal-Clad Switchgear

FIRST, there's extra safety in Allis-Chalmers Metal-Clad Switchgear. This added safety caused one utility engineer to say — "No one could ever get hurt around this equipment." The features shown here are some of the things he was talking about.

But, safety is only part of the story. There's extra reliability and ease of installation engineered into Allis-Chalmers Metal-Clad Switchgear.

It's a bigger story than we can tell even in the pictures shown — so get the full facts. Call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wis.

A-4612

CHALMERS

Prevent service interruptions... Install Wagner Distribution Transformers with the Wagner Winding-Temperature Overload Indicator

No more guesswork. No more costly, time-consuming load surveys. When you install Wagner distribution transformers equipped with the Wagner Winding-Temperature Overload Indicator you have a safe, accurate loading guide for distribution systems feeding rapidly growing residential and small industrial loads.

If an indicator-equipped transformer is overloaded, a brilliant red signal—which can be easily spotted—flashes on immediately. The operation of the transformer is in no way affected.

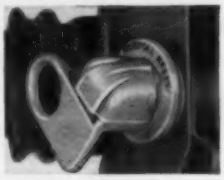
With this advance warning of overloads approaching the danger point, you have plenty of time to replace the overloaded transformer with a larger unit before a customer-annoying outage occurs.

REMEMBER, **the Wagner Indicator is actuated by winding temperature**

This is important because transformer winding copper is subject to the highest temperature. There is no time delay as with indicators actuated by oil temperature. When the thermal element embedded in the transformer winding is heated to a predetermined temperature by an overload—on goes the signal lamp. Lamp stays lit until turned off by lineman who moves operating handle to "RESET" and then back to "NORMAL" position... handle is designed for hot-stick operation.

Write today for more information about Wagner indicators or, better yet, have a Wagner engineer explain how Wagner indicators can save you money by safeguarding your investment and preventing service interruptions... there's no obligation of course.

Wagner Winding-Temperature Overload Indicators can be furnished on Wagner oil-filled distribution transformers 3 to 100 kva single-phase and 9 to 150 kva three-phase, 15 kv and below.



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ELECTRIC MOTORS - TRANSFORMERS - INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS - AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

155-17

SOLAR ENERGY SYMPOSIUM speakers included Dr J. E. Hobson, Stanford Research Institute; H. B. Sargent, American & Foreign Power; F. Daniels, Wisconsin Univ

Progress Slows Solar Energy

Underdeveloped and non-industrial countries will apply sun's energy faster than U. S., Symposium on Solar Energy is told

Applied solar energy will find its place in the underdeveloped and non-industrial countries much faster than it will in this country. But much work still separates solar energy from economic application even on a small scale.

Evidence supporting these conclusions was presented in papers and discussions at the First World Symposium on Applied Solar Energy held recently at Phoenix and Tucson. Close to 1,000 delegates from 30 countries heard discussions of theoretical and practical aspects of capturing the sun's energy to generate modest amounts of low-voltage power, heat and cool homes, pump water, and cook food. Symposium sponsors were the Association for Applied Solar Energy, Stanford Research Institute, and University of Arizona.

Solar Energy Needed

Expanding population and increased per capita use of energy are putting greater demands for energy upon the non-replaceable energy sources, said Henry B. Sargent, president, AASE and American & Foreign Power Co. To supplement these declining sources initially and to replace them in the future, it is desirable to investigate aggressively techniques for economic applications of the energy from the sun.

Dr J. E. Hobson, director, Stanford Research Institute, said that scientific research is needed badly for the many problems connected with solar energy. Practical and economic storage devices for solar energy must be found, and new and efficient converting processes must be developed. He added that solar heating and solar machines can be economical now in a few cases in isolated areas.

Test Results Reported

Tests with a solar collector heat pump in New Haven, W. Va., reported E. R. Ambrose, American Gas & Electric Service Corp, have produced important observations which warrant further research. Among them are:

- Available solar heat recovered by the collector can vary from 50 to 100%.
- The collector must be able to use outdoor air as well as solar energy for its heat source. It also may be used as a heat sink.
- Solar collector heat pump water heaters have promise.

Winter solar heating of houses in northern Europe is impossible because of the inadequacy of heat quantities, Harold Heywood, University of London, reported. Although technically possible, solar heating in early and late summer can be justified economically. But for localities in North and South Africa, Australia, and New Zealand harnessing of solar energy for house heating is worthy of serious research.

The silicon solar battery installation at Americus, Ga., is still expermental, G. L. Pearson, Bell Telephone Laboratories, said. Although its efficiency is about 8%, it is too expensive to compete with conventional power sources. In fact, none of our present engines and generators will be rendered obsolete by solar energy, asserted Dr Farrington Daniels, University of Wisconsin. Solar energy, like nuclear power, will supplement in its own way additions of power-producing units.

Crystallizing the results of the symposium, R. C. Jordan, University of Minnesota, said in the immediate future solar-mechanical power will be most practical for:

- Small power system located in remote areas and having energy storage facilities.
- Power systems where intermittent operation is not a deterrent.
- Limited, specialized use in the field of astronautics for the generation of power on potential artificial satellites.

Announcement of the organization of a "Laboratory of the Sun" in Arizona was interpreted as a step forward. Under the auspices of the Association for Applied Solar Energy, Stanford Research Institute will staff a Phoenix laboratory to work with an annual $500,000-$750,000 budget. Solar work underway at SRI, primarily on solar furnaces and dissociation of water, will be concentrated and accelerated. Work being done at Arizona universities will be coordinated and expanded.

New Look for Charleston

Charleston, West Virginia, has a new look due to completion of Appalachian Electric Power Co's three-year, $2.5-million project to place all downtown electrical facilities underground. The power system, capable of delivering up to four times the present electrical demand, consists of underground ducts and transformer vaults with completely automatic transformers having a 50,000-kw capacity. New street lights also have been installed.

Shipments, Orders and Open Manufacturing Capacity for Electrical Equipment, 1954–1958 and Later

Total Capacity Shipped and on Order and Scheduled for Shipment	Shipped 1954	Shipped First 9 Months of 1955	On Order as of Oct. 1, 1955: Last 3 Months of 1955	On Order as of Oct. 1, 1955: 1955	On Order as of Oct. 1, 1955: 1956	On Order as of Oct. 1, 1955: 1957	On Order as of Oct. 1, 1955: 1958 and Later	Total Scheduled for Shipment as of 10-1-55	New Capacity Scheduled 4-1-55 to 10-1-55	Capacity Shipped 4-1-55 to 10-1-55
LARGE STEAM TURBINE-GENERATORS[3] (10,000 Kw and Larger)[4]										
U. S. El Pr Syst[1]	10,862,700	7,043,800	2,086,000	9,129,800	6,322,400	9,061,000	4,218,700	21,688,100	6,180,800	4,507,300
U. S. Industrials	428,100	45,000	43,700	88,700	591,900	608,700	.....	1,244,300	842,500	25,000
Outside U. S.	453,100	397,600	87,500	485,100	838,500	62,500	.....	988,500	129,000	353,600
TOTAL	**11,743,900**	**7,486,400**	**2,217,200**	**9,703,600**	**7,752,800**	**9,732,200**	**4,218,700**	**23,920,900**	**7,152,300**	**4,885,900**
Est. Open Capacity[2]	.....	.....	.....	.....	300,000	1,900,000	11,000,000			
SMALL STEAM TURBINE-GENERATORS[3] (4,000 to 9,999 Kw)[4]										
U. S. El Pr Syst[1]	84,400	50,000	31,200	81,200	121,900	9,400	.....	162,500	98,700	40,600
U. S. Industrials	171,600	67,700	46,900	114,600	97,700	41,900	.....	186,500	122,700	52,100
Outside U. S.	108,100	42,100	11,300	53,400	85,000	10,000	.....	106,300	82,500	19,000
TOTAL	**364,100**	**159,800**	**89,400**	**249,200**	**304,600**	**61,300**	.....	**455,300**	**303,900**	**111,700**
Est. Open Capacity[2]	.....	.....	.....	.....	200,000	600,000	1,400,000			
STEAM GENERATORS (450 Psi Pressure and Higher)[5]										
U. S. El Pr Syst[1]	76,810	33,440	6,760	40,200	74,763	15,711	1,200	98,434	44,935	23,035
U. S. Industrials	14,297	5,366	4,389	9,755	8,374	.....	.....	12,763	9,773	3,893
Outside U. S.	7,682	4,387	3,147	7,534	11,945	.....	.....	15,092	7,994	3,002
TOTAL	**98,797**	**43,193**	**14,296**	**57,489**	**95,082**	**15,711**	**1,200**	**126,289**	**62,702**	**29,930**
Est. Open Capacity[2]	.....	.....	.....	.....	5,000	123,000	143,000			
STEAM GENERATORS (450 Psi Pressure and Higher)[6]										
U. S. El Pr Syst[1]	.....	39,677	7,429	47,106	87,956	18,656	1,414	115,455	52,767	27,310
U. S. Industrials	.....	6,340	5,230	11,570	9,467	.....	.....	14,697	11,167	4,736
Outside U. S.	.....	4,939	3,649	8,588	13,483	.....	.....	17,132	8,838	3,375
TOTAL	.....	**50,956**	**16,308**	**67,264**	**110,906**	**18,656**	**1,414**	**147,284**	**72,772**	**35,421**
WATER-WHEEL GENERATORS[7] (4,000 Kw and Larger)[4]										
U. S. El Pr Syst[1]	1,408,000	902,500	400,700	1,303,200	960,000	848,000	1,072,200	3,280,900	829,400	647,500
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	184,000	90,200	84,000	174,200	69,300	.....	.....	153,300	.....	15,000
TOTAL	**1,592,000**	**992,700**	**484,700**	**1,477,400**	**1,029,300**	**848,000**	**1,072,200**	**3,434,200**	**829,400**	**662,500**
Est. Open Capacity[2]	.....	.....	.....	.....	300,000	2,200,000	2,300,000			
HYDRAULIC TURBINES (5,000 Hp and Larger)[8]										
U. S. El Pr Syst[1]	3,148,900	1,670,100	580,800	2,250,900	1,333,000	1,238,700	1,150,000	4,302,500	564,000	964,200
U. S. Industrials	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Outside U. S.	67,000	119,600	12,500	132,100	5,400	.....	.....	17,900	5,400	100,800
TOTAL	**3,215,900**	**1,789,700**	**593,300**	**2,383,000**	**1,338,400**	**1,238,700**	**1,150,000**	**4,320,400**	**569,400**	**1,065,000**
Est. Open Capacity[2]	.....	.....	.....	.....	600,000	3,200,000	3,700,000			
POWER TRANSFORMERS (501 Kva and Larger)[9]										
U. S. El Pr Syst[1] & Indl.	58,373,000	34,669,000	13,402,000	48,071,000	27,153,000	5,062,000	620,000	46,237,000	26,150,000	23,593,000
Outside U. S.	1,233,000	1,215,000	321,000	1,536,000	306,000	.....	.....	627,000	310,000	790,000
TOTAL	**59,606,000**	**35,884,000**	**13,723,000**	**49,607,000**	**27,459,000**	**5,062,000**	**620,000**	**46,864,000**	**26,460,000**	**24,383,000**
Est. Open Capacity[2]	.....	.....	.....	9,000,000	46,000,000	67,000,000	74,000,000			

[1] U. S. Electric Power Systems. [2] Estimated open manufacturing capacity for production of additional units. [3] Manufacturers' max. rated capability. [4] Figures in kilowatts. [5] Figures in 1,000 lb steam per hr. [6] Figures in heat output, millions Btu per hr. [7] Manufacturers' rating of generators. [8] Figures in horsepower. [9] Figures in kilovolt-amperes.

Installed Generating Capacity Hits Record

• Scheduled installations of thermal and hydraulic generating capacity (4,000 kw units and higher) on U. S. power systems in 1955 are expected to total 13,026,778 kw, the highest on record. This capacity includes almost 4 million kw for plants feeding atomic energy projects.

• Installations of generators in first 9 months of 1955 totaled 9,095,520 kw, which is also a record.

• Advancements in generating capacity installed ahead of schedule for planned installations exceeds by about 55% the slippage behind schedule of planned installations of steam turbine-generators and hydro-generators for the six-month period (Apr. 1-Oct. 1). The advancement amounted to 1,282,000 kw for 13 generators and slippage amounted to 827,000 kw for 14 machines, according to additional data compiled with the survey.

• Two atomic power projects are included in the survey — Duquesne Light Co's 100,000-kw unit which is scheduled for operation in 1958, and Pennsylvania Power & Light Co's 150,000-kw unit scheduled for operation after 1959.

• Largest steam turbine-generator on order is a 325,000-kw unit for Philadelphia Electric Co, scheduled for installation in 1958.

Foregoing five items are significant developments from the 18th Semi-annual Electric Power Survey made by Edison Electric Institute.

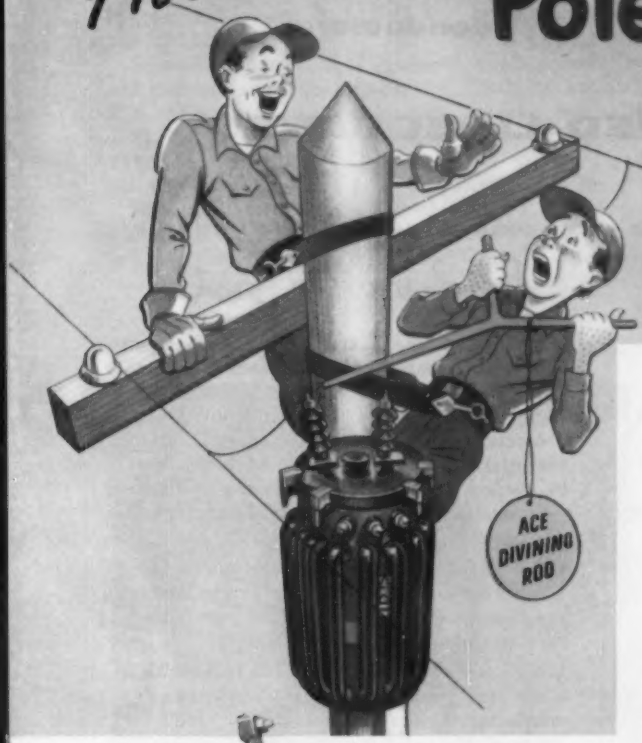
The EEI survey covers steam turbine-generators, steam generators, hydro-electric generators, hydraulic turbines, and transformers. Information compiled as of Oct. 1, 1955, relates to production schedules, shipments, and estimated open manufacturing capacities for 1954 through 1958. It was furnished by 19 of the country's leading manufacturers of heavy electric power equipment. Data pertaining to steam turbine-generators are based upon the manufacturers' maximum rated capability; the other equipments on nameplate ratings.

Production . . . Electric generating equipment, thermal and hydraulic, scheduled for U. S. electric utilities in 1955 totals almost 10,515,000 kw. This amount is 1,840,900 kw lower

(*Continued on page* 59)

"Hold it, Jerry!... no use checking that Pole Star for moisture...

It's sealed with NITRILE RUBBER* GASKETS!"



The man is right, Jerry — even if that Pole Star transformer you're checking has been on the pole for years. The use of nitrile gaskets gives Pole Star transformers an air-tight, moisture-proof construction that *stays* that way during hot, humid summers as well as frigid, icy winters. Nitrile gaskets also are highly resistant to oil, dust, and all types of atmospheres.

Another important advantage is the ease of re-sealing with nitrile gaskets. No cement is required, and gaskets can be used again and again without any time-consuming scraping and cleaning. For cover and handhole seals, retaining rings assure exact positioning of the gaskets.

Pole Star distribution transformers are available in all single phase sizes from 3 through 500 kva, in voltages through 67,000 volts.

Nitrile rubber gaskets assure oil-tight joints in all Pole Star transformers. Gaskets at major seals are positioned by retaining rings.

*

what is NITRILE RUBBER?

Nitrile is not the exclusive development of a particular manufacturer or user, but rather is a class of synthetic rubber produced by the polymerization of acrylonitrile in butadiene. Sometimes referred to as "Buna N" rubber, nitrile has served as the gasketing material in Pole Star transformers since 1948.

pt

POLE STAR

Pennsylvania Transformer Company

A McGraw Electric Company Division

CANONSBURG, PA. Greater Pittsburgh District

protect Short-Span **conductors**

use PREFORMED LINEGUARDS*

get ample protection for urban distribution at

Reduced Cost!

● Preformed Line Guards will save money on short-span urban distribution lines . . . whether ACSR, all-aluminum, or copper conductors are in use. Use them on all conductors where protection against vibration damage is not essential and standard Armor Rods may not be needed. Line Guards are smaller in diameter —fit insulator grooves of both old and new designs.

Check P L P price lists. You will notice Line Guards are *lower* in price than Armor Rods . . . yet, Line Guards provide sufficient protection on short spans.

Line Guards . . . developed from Armor Rods —are used like Armor Rods . . . protecting conductors against arcover, chafing, and mechanical wear due to concentrated stresses on light or short-span construction.

Let your P L P Representative help you select the most economical P L P Product for your application. Write or call Cleveland: EX 1-3571

**Made in accordance with or for use under one or more of the following U. S. Patents: 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.*

Pin Insulator

Line Guards should be used over the conductor where tie wires are applied . . . guard against tie-wire damage.

Line Post

Line Guards permit you to apply your ties as tightly as needed without fear of conductor damage.

Clamp Type

Line Guards fit snugly . . . cushion the conductor from clamp-pressure damage and concentrated stresses.

PREFORMED LINE PRODUCTS COMPANY
5340 St. Clair Avenue
Cleveland 3, Ohio

(*Continued from page 56*)

than the shipments in 1954. The major decrease is in thermal generating equipment. Scheduled production of hydro-electric generators in 1955 totals 1,303,200 kw.

Scheduled production of thermal and hydraulic generating capacity for U. S. utilities in 1956 (based on Oct. 1, 1955) totals about 7,404,300 kw, in 1957 about 9,918,400 kw, in 1958 and later about 5,290,900 kw.

Shipments . . . For all generating equipment except hydraulic generators, and for power transformers the backlog on scheduled shipments increased for the six months—Apr. 1 to Oct. 1, 1955. If shipments are on schedule in 1956, installations will total 7,878,125 kw.

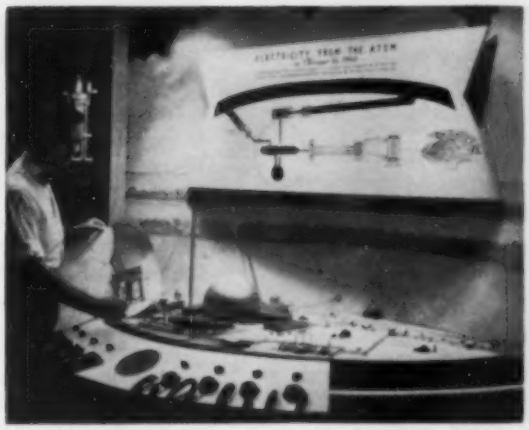
New Orders . . . New thermal and hydro-generator capacity ordered for U. S. power systems during the six-month period (Apr. 1-Oct. 1) totalled 7,108,900 kw. This amount is a 115% increase over 3,302,500 kw for the comparable period in 1954. But it is less than the capacity (10,800,700 kw) ordered for the previous six months—Oct. 1, 1954-Apr. 1, 1955.

Steam turbine-generators for new capacity scheduled from Apr. 1 to Oct. 1 are: For 1956, 27 units totalling 549,000 kw; for 1957, 29 units totalling 3,476,000 kw; for 1958 and later, 19 units totalling 2,291,000 kw.

Hydro-electric generator additions for Apr. 1 to Oct. 1 are: For 1956, 9 units totalling 312,000 kw; for 1957, 5 units totalling 306,000 kw; for 1958 and later, 4 units totalling 211,000 kw.

The record indicates that on Oct. 1, approximately 6.3 million kw of new generating capacity was on order for U. S. electric utilities for which steam generators had not been ordered. Boilers are often ordered six months or more after the generators are ordered because of the shorter manufacturing cycle for the steam generating units.

ARGONNE NATIONAL LABORATORY'S EBWR PROJECT



COMMONWEALTH EDISON'S 180-MW NUCLEAR PLANT

Atomic Power Featured at Chicago Exposition

The relation of atomic power to mechanical engineering was a feature of the Chicago Exposition of Power and Mechanical Engineering at the Chicago Coliseum, Nov. 14 to 18. This exposition was held under the auspices of the American Society of Mechanical Engineers in conjunction with its Diamond Jubilee Annual Meeting.

The Atomic Power Section disclosed the latest developments in conventional power plants and the application of power to industrial uses in general. Among the displays were:

A model of the 180,000-kw atomic power station with a dual-cycle boiling-water reactor to be constructed by 1960 near Chicago for Commonwealth Edison Co by General Electric Co held much interest for local visitors.

Another exhibit was the EBWR "Borax III" power plant for generation of 20,000 kw of heat and for providing design data for a 5,000 kw boiling-water reactor plant. It is an Argonne National Laboratory project being built near Chicago, for which Allis-Chalmers Manufacturing Co is the principal subcontractor (EW, Nov. 14, 1955, p 226).

A third display was a model for nuclear power and for medical and nutritional research, exhibited by Atomics International, division of North American Aviation, Inc.

Sylvania Electric Products, Inc, displayed many forms and shapes for atomic reactor fuel elements.

Some equipment items having utility interest:

- A car shaker which mounts on the side of a hopper-type coal car is reported to have an effective effort of approximately 6,400 lb and to save up to 80% on unloading costs. It is a product of National Conveyor & Supply Co, Chicago, Ill.
- No. 4 magnetic starter, rated up to 100 hp, 440 v, and 50 hp, 220 v, with overload relay and start-stop push buttons will be available early in 1956 from Furnas Electric Co, Batavia, Ill.
- An impact noise analyzer, for noise with a sharp rise to the wave and for use with the No. 1551A sound level meter, is scheduled to be in production in spring of 1956 by General Radio Corp, Cambridge, Mass.
- A line of vibrating-reed, 2.5-in. diameter, flush-mounted tachometers is expected to be available in 1956 from Herman Sticht & Co, New York, N. Y.

BUSINESS OUTLOOK

Electrical World
DECEMBER, 5, 1955

The outlook in brief: There's been a **marked revival of the boom atmosphere. It was sparked by announcement of industry's ambitious investment plans, which helped restore confidence in business confidence.** The subsequent upturn in Wall Street also contributed. The Federal Reserve is still worrying about inflation. **The possibility of material shortages next year is now of serious concern to business.**

Signs of the times: **Auto production is headed for a fabulous 8 million car record.** Steel output keeps pushing 99% of capacity. Raw material prices and weekly hours have begun to edge up again. **Shortages, mainly of metals and skilled labor, are slowing expansion in a number of lines.** Shortages in freight cars, and industrial components may also create difficulties in the future. There's no sign of letdown in consumer buying. Bank loans are still expanding and are approaching an all-time high. Despite recent talk of a possible letup in the credit squeeze, the **Federal Reserve** has just given a fourth turn to the monetary screw, putting **discount rates up to 2½%.**

One big question for 1956: Will industry find the necessary materials to carry out present expansion plans? **New McGraw-Hill survey showed business planning to step up plant and equipment spending next year by 13%. Expected increases in some lines were awe-inspiring: 72% in iron and steel,** for example, 68% in autos, and 54% in non-ferrous metals. Part of this represents merely an allowance for higher prices. Even so, the programs are big enough to raise the question of materials in very sharp form.

Note that, in this same Survey, the steel companies estimated they would **sell** only 5% more next year. And producers of non-ferrous metals expected to raise their sales by only 2%. These estimates are probably pretty close to what they think they can turn out. At first sight, this all seems to add up to a pretty tight pinch on materials.

There's one obvious way a squeeze could be avoided. Even small cutbacks in autos and housing might release a substantial amount of materials. With a slower buildup of consumer credit next year, such cutbacks could easily occur. Despite brave talk, Detroit would not be too shocked if next year's car sales were off by a million or more cars. (This would still make 1956 a banner car year by pre-1955 standards.)

Pessimists argue any slowdown in auto sales will be a signal for business to stall on its own investment plans. Optimists cite growing evidence that these plans are now hitched to long-term growth prospects, disregarding minor ups and downs in current sales. Decision on who's right about this could be fundamental for the shape of 1956 and 1957. **If materials released by small cutbacks in autos, housing, T-Vs, etc., could be smoothly absorbed by industry for expansion needs, then 1956 might be a year of stable growth,** avoiding **both** recession **and** inflationary shortages.

One thing seems clear. **If there are bottlenecks on expansion in 1956 they will not come from power-shortages.** Reserve capacity should more than cover foreseeable needs. **Nor will the power industry take an undue share of scarce materials:** outlook is for slightly **reduced** capital spending in 1956.

COMING RIGHT UP!

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IN THE INDUSTRY

PR Problems Plague Management

Executives point up shortcomings of present public relations efforts; see need for better coordinated, more unified programs; wider agreement on aims

Utility management is becoming keenly aware of the crucial importance of good public relations on the part of the industry. Executives know that utility operations touch every segment of the producing and consuming public. On the good will and confidence of that public depend the future growth and the prosperity of the industry.

The awareness is evident in the casual conversation as well as in the formal speeches, of industry leaders. Put any group of top utility executives together, and it is not long before the conversation comes around to industry public relations. You'll hear gripes, sure. But more often you'll hear well-considered opinions on the weaknesses of present PR efforts.

In the hopes of setting some of these problems in clearer perspective, we recently talked with a number of top utility executives. Here is a summary of the thoughts of the men who hold highly responsible positions in our industry.

Major Problems Face Industry

The number of industry organizations in the general field of public relations, publicity, and advertising is of concern to utility executives. They see the need for more coordination and unity of purpose among such groups as ECAP, PIP, EEI, and NAEC. Some are dissatisfied with the results of one or more of these activities. There appears to be growing support for a single group to handle the public relations affairs of the industry.

You hear complaints that the industry is too often found on the defensive. Everywhere there is the desire to seize the offensive in PR efforts relating to legislation, rates, service, and other matters. As a matter of policy, it was suggested that utilities might decide what they must oppose. On all other matters they should show a positive attitude.

There is considerable support for the idea that utility management needs to agree on more of the fundamental aims if the industry is to speak in a loud, clear voice to its customers and the public.

This thought is part and parcel of the idea that the industry has not adequately developed local interest in national issues. Better, more effective ways must be developed for creating interest in tax problems and emphasizing the clear distinction between public power on one hand and public roads, public parks, and public schools on the other.

One of the most thoughtful leaders of the industry believes that the biggest threat to the utility industry is public indifference—public indifference to private versus public power and public indifference to tax problems, TVA, the preference clause, and other issues of vital importance to the industry.

Another top executive feels that utilities, which are classed as "big business" in most communities, are not giving the customer a feeling that he has a forum where his complaints can be aired. Company red tape, he feels, often frustrates the customer.

Students Need to Be Informed

There is a new problem brought about by the prospect of nuclear power. How much of the utility research effort is the customer willing to support for the benefit of his children and mankind?

A number of executives feel that too little is being done to give school children an understanding of business in general and particularly the electric utility business. More effort needs to be made in this area if utilities are to attract the talented and trained youth toward a utility career.

These, then, are some of the major public relations problems facing the industry. Some can be solved by top management alone. Others require the combined efforts of every member of the utility team and especially the efforts of the men skilled in the practice of public relations.

TECHNICAL NOTES

Pipe lines for gas, oil, or water are crossing under transmission lines with increasing frequency. Tower footings can suffer accelerated corrosion unless the galvanic potentials at these spots are properly controlled.

Pipe-type cable can be protected against galvanic corrosion by isolating the pipe from all structures and grounding it through one cell of each station battery. Tests show battery can tolerate 15,000-amp 60-cps fault for one sec.

Lightning, the scourge of man's electric systems, is now thought to perform the vital service of combining atmospheric nitrogen with oxygen to fall in rain and nourish man's crops.

Air-pressure-rundown testing helps to adjust air circuit breaker contacts so they will not "hang" within arcing distance for a service operation under minimum pressure.

Similarity between microwave transmission and a light beam appears to be confirmed by discovery that the radio beam can be focused by passing it through a "lens" of shaped metal plates.

Adding relays and contactors to increase reliability of a control system sometimes merely increases the number of components in which failure can cause undesired operation. Careful study is required to be sure the added components guard against faulty operation.

Oklahoma on Depreciation

Corporation Commission orders Public Service Co to use normalized taxes and restricted surplus method for tax deferral

The Oklahoma Corporation Commission has ordered Public Service Co of Oklahoma to use normalized taxes and a restricted surplus method to account for the deferral of taxes arising from the application of Section 167 of the Internal Revenue Code of 1954. The order was dated July 18.

In its findings the commission noted that ". . . it was the intent of the Congress of the United States, as stated in the Congressional Committees' reports, in enacting the liberalized depreciation policies in the Internal Revenue Code of 1954 to encourage and stimulate new investment and economic activity by providing funds for new construction and facilities through the deferral of income taxes by such accelerated depreciation methods and that the applicant will be enabled to have funds available for the financing in part of its construction requirements if it elects to use the accelerated depreciation and thus be able to defer the issuance of a portion of new securities which would otherwise be required if its construction program is to go forward without delay."

Two Methods Compared

After mentioning the fact that there was similarity between the end results which the Government sought to achieve under Section 167 and the Amortization of Emergency Facilities enacted in the Revenue Code of 1950, the Commission went on to say "It is contended that in principle there is no difference between the accelerated amortization of emergency facilities and the accelerated depreciation of depreciable properties under Section 167 of the Internal Revenue Code of 1954 as in the case of both the effect is to reduce the amount of federal income taxes payable during the early years of the service life and increase the amount of federal income taxes payable in the later years of the service life of the depreciable property. This simply defers the payment of federal income taxes since the aggregate income tax payments, if the tax rates remain constant, will be the same whether the greater depreciation deductions are taken in the early years of the service life and smaller deductions are taken in the later years of the service life or are spread ratably over the service life of the depreciable property as in the case of straight line depreciation."

In its order, the commission said that ". . . Public Service Co of Oklahoma be, and it is hereby, authorized and directed to follow the accounting procedures hereinafter set forth in respect to those portions of the costs of its depreciable plant, property, equipment and related facilities which it may elect to depreciate for federal income tax purposes in accordance with the declining balance, the sum of the years-digits, or other consistent methods producing results similar to the declining balance method, under and pursuant to the provisions of Section 167 of the Internal Revenue Code of 1954, and the resulting deferrals in federal income taxes, to wit:

"(a) To account on its books for that portion of its properties which are the subject of accelerated depreciation pursuant to its election under Section 167 of the Internal Revenue Code of 1954 in the same manner as its other properties, and to accrue depreciation therefor at rates consistent with its rates for like property not subject to accelerated depreciation.

"(b) During those years of the service life of any of its properties

JCP&L Uses Electronic 'Brain'

Dorothea Mooney, Jersey Central Power & Light Co, is shown inserting cards in company's first electronic 'brain' which is used to compute bills in the customer billing department in Allenhurst, N. J.

The instrument adds, subtracts, multiplies, and divides. It punches cards at the rate of 100 per minute, at the same time checking itself. The calculating punch, Ernest F. Mearns, department supervisor, said, has enabled the department in which it is located to increase mechanical computing capacity by 60%. The department computes bills for 225,000 customers with 259,000 meters each month.

which are the subject of accelerated depreciation pursuant to its election under Section 167 of the Internal Revenue Code of 1954, in which a deferral of federal taxes on income results from the use of the accelerated depreciation deduction in lieu of the deduction allowable under the tax depreciation method heretofore followed, to charge to 'Provisions for Deferred Federal Income Taxes', a subaccount under Taxes, as an operating expense, and credit to 'Earned Surplus Restricted for Deferred Federal Income Taxes', a subaccount under Earned Surplus, an amount or amounts in total for each year equal to such deferral of Federal income taxes.

Accounting Specified

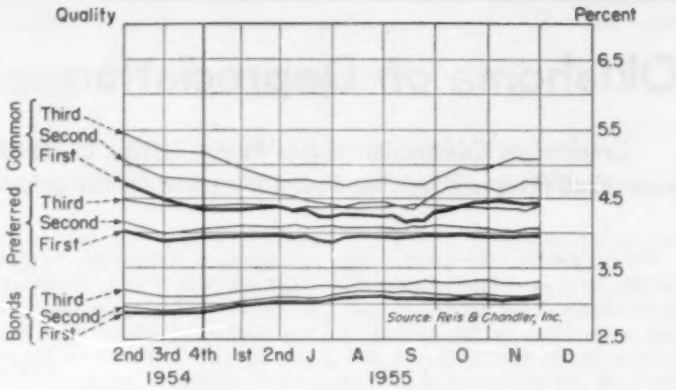
"(c) Commencing with the year in which its deduction of depreciation for federal income tax purposes in respect of any of its properties subject to accelerated depreciation is less than such deduction otherwise would have been if depreciation on such properties had been computed at rates consistent with its rates for like properties not subject to accelerated depreciation, and continuing until 'Earned Surplus Restricted for Deferred Federal Income Taxes', applicable to such properties is exhausted, or such properties are retired from service, to charge to 'Earned Surplus Restricted for Deferred Federal Income Taxes' and to credit to 'Portion of Current Federal Income Taxes Deferred in Prior Years', a subaccount under Taxes, an amount or amounts in total for each year equal to the increase in federal income taxes resulting from such lower federal tax depreciation deduction.

"(d) This order shall not be construed as an adjudication of any issue which may arise in any future rate proceeding."

FINANCIAL BRIEFS

Texas Utilities Co will pay Jan. 3 a quarterly common stock dividend of 32¢ a share as compared with 29¢ a share before the 2-for-1 stock split . . . **Union Electric Co of Missouri** invites bids for the purchase of $500,000 par value of Muzak Corp preferred stock and an interest in a royalty agreement with Muzak.

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Nov. 23.....	3.09	3.11	3.28	3.98	4.04	4.38	4.42	4.75	5.14
Nov. 17.....	3.08	3.10	3.27	3.97	4.04	4.35	4.42	4.77	5.14

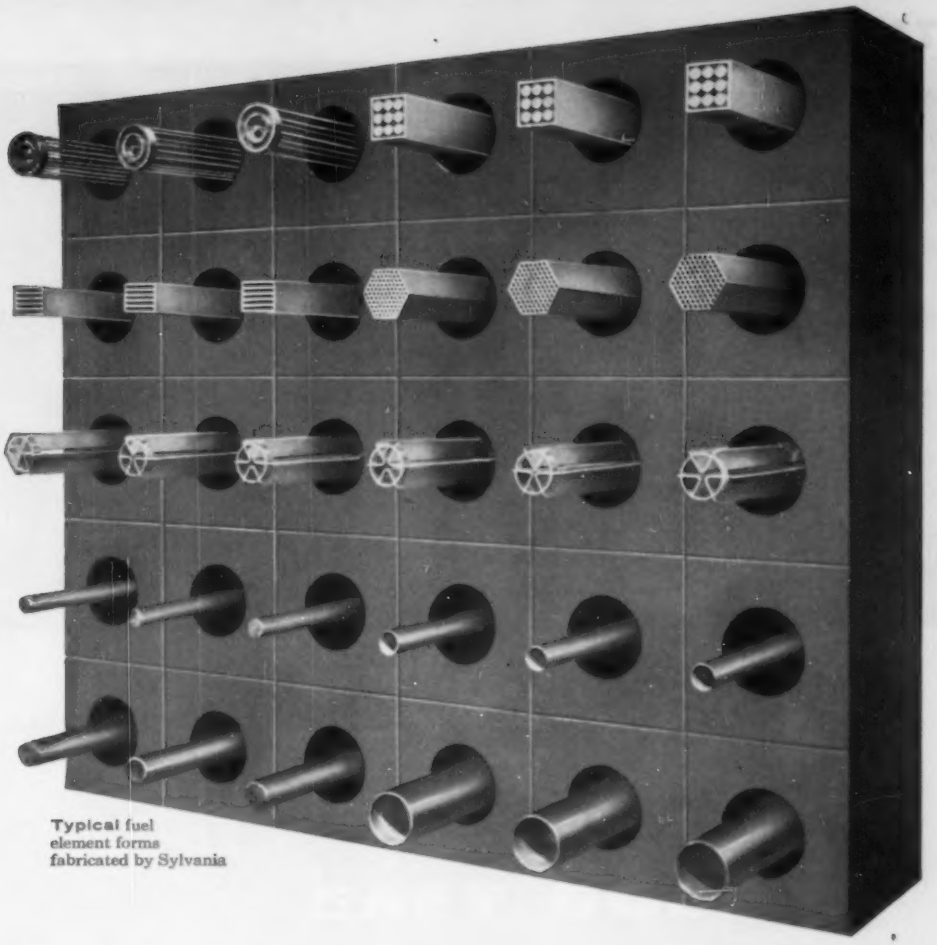
Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Boston Edison.....	12	Sept.	$7,032,117	$6,531,080	$2.59	$2.41
Carolina Power & Light.....	12	Oct.	9,003,916	7,853,432	....	....
Central Vermont Public Service	12	Oct.	1,430,184	1,230,510	1.32	1.12
Cleveland Electric Illuminating	12	Sept.	16,525,998	14,206,963	2.29	1.95
New York State Electric & Gas	12	Oct.	10,740,138	9,357,005	3.02	2.58
Southern Co. consolidated.....	12	Oct.	25,454,983	23,633,676	1.41	1.30
Utah Power & Light.....	12	Oct.	6,754,632	5,589,673	3.04	2.74

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
NOVEMBER 23-30			
BONDS			
San Diego Gas & Electric—1st mtg 3¼% due 1985.....	$18,000	99.619%	3.27%
Baltimore Gas & Electric—1st mtg 3¼% due 1990....	30,000	100.75	3.215
PREFERRED STOCK			
Montana-Dakota Utilities—50,000 sh 4.70% $100 par..	$5,000	$100.00	4.70%
COMMON STOCK			
Rochester Gas & Electric—200,000 sh (being offered commonholders on 1-for-7 basis, record Nov. 25 to expire Dec. 12).....	$8,100	$40.50	5.53%
Housatonic Public Service—12,774 sh (being offered commonholders on 1-for-29 basis, record Nov. 7 to expire Dec. 12).....	268	21.00	6.66
SCHEDULE FOR DECEMBER			
BONDS			BID DATE
Consolidated Edison—1st mtg due 1985.....	$70,000	.....	Dec. 6
Connecticut Light & Power—1st mtg 3⅛% due 1985..	20,000	.....	Dec. 8 (a)
Delaware Power & Light—1st mtg due 1985.....	10,000	.....	Dec. 13
PREFERRED STOCK			
Virginia Electric & Power—125,000 sh $100 par.....	$12,500	.....	Dec. 6
Delaware Power & Light—50,000 sh $100 par.....	5,000	.....	Dec. 13
COMMON STOCK			
Columbus & Southern Ohio Electric—250,000 sh.....	.....	.....	Dec. 6 (b)

Notes—(a) Putnam & Co group, underwriters, and (b) Dillon, Read & Co, underwriters.



Typical fuel element forms fabricated by Sylvania

SHAPES OF THINGS TO COME

. . . in atomic power

The manufacture of nuclear fuel is one of the most critical aspects of the world-wide effort being devoted to the attainment of economic electric power from the atom.

Efficient utilization of nuclear fuel depends greatly upon the design and construction of the fuel element itself. Shape, size, degree of enrichment, mechanical structure all play a part in extracting maximum energy with minimum fuel cost. Finally, the *reprocessing* of used fuel elements requires expert knowledge and specialized equipment.

With more than eight years of successful experience in solving advanced technical problems in atomic energy . . . Sylvania has long been a leading fabricator of reactor fuel elements and assemblies. Sylvania's Atomic Energy Division is equipped to supply production quantities of standard fuel elements . . . or special designs to meet your particular requirements.

Whether your reactor plans are immediate, or for the future . . . our scientific and engineering staff will gladly discuss your problems with you. For your reference files, write for: *Sylvania Atomic Fuels and Reactor Components.*

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STATISTICS

Summer Peaks 'Put the Heat' on Power Suppliers

(Summer Peak Loads as a Percentage of That of Previous and (Following) December)

Power Supply Region	1953	1954	1955	1956	1957	1958
I	97 (93)	96 (90)	97 (91)	98 (93)	99 (94)	99 (94)
II	97 (94)	96 (88)	103 (86)	100 (93)	100 (94)	100 (94)
III	100 (90)	104 (90)	108 (90)	97 (90)	97 (90)	97 (90)
IV	104 (93)	102 (96)	105 (97)	102 (98)	104 (98)	105 (99)
V	126 (117)	135 (125)	138 (123)	141 (127)	140 (128)	141 (129)
VI	96 (91)	106 (99)	113 (92)	104 (94)	103 (95)	103 (95)
VII	104 (88)	91 (82)	93 (81)	94 (88)	96 (88)	93 (88)
VIII	110 (104)	108 (100)	110 (99)	109 (102)	109 (101)	107 (101)
Total U.S.	102 (95)	102 (94)	105 (93)	103 (96)	103 (97)	103 (97)

Source: Edison Electric Institute Power Survey

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Sept.	110.91	110.03	99.16	11.8
Peak—Class I Systems / million kw	Aug.	91.6	89.3	79.7	14.9
Estimated Dec. '55 Peak	Sept.	96.82	96.54	96.21	0.6
Production—billion kwhr	Sept.	46.34	49.35	39.55	17.2
Hydro		8.17	9.53	7.80	4.7
Fuel		38.18	39.82	31.74	20.3
Sales—billion kwhr	Aug.	43.44	40.89	36.28	19.7
Residential		10.46	9.89	9.30	12.5
Commercial		7.39	6.92	6.56	12.7
Industrial		22.84	21.50	17.80	28.3
Other		2.74	2.59	2.62	4.6
Fuel Consumption	Sept.				
Coal—million tons		12.06	12.59	9.72	24.1
Oil—million barrels		5.18	5.37	4.90	5.7
Gas—billion cu ft		120.17	132.55	118.62	1.3
Net Income Class A & B Co's—$ million	Sept.	100.23	93.95	92.26	8.6
Residential Customers—millions	12 mos.	43.96	43.83	42.69	3.0
Revenue per kwhr	ended	2.66¢	2.66¢	2.71¢	−1.9
Avg kwhr per customer	Aug. 31	2,682	2,662	2,478	8.2
Avg. annual bill		$71.34	$70.81	$67.15	6.2

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Oct.	146	142	130	12.3
ENR Construction Cost	Oct.	141.2	141.0	134.6	4.9
BLS Cost-of-living	Oct.	114.9	114.9	114.5	0.3
NEMA Sales	Sept.				
Insulation materials		156	147	123	26.8
Electric appliances		131	111	115	13.9
Household refrigerators		85	86	73	16.4
Wholesale prices	Oct.				
Motors and generators		125.3	125.1	121.8	2.9
Transformers and regulators		129.2	129.2	128.1	0.9
Switchgear and fuses		146.3	146.1	135.1	8.3
GNP—annual rate—$ billion	3rd Qtr.	392.0	384.8	358.8	9.3

Transformer fabrication must be done carefully, with skill . . . to assure proper performance and to prevent damage that might later result in breakdowns.

That's why transformer fabrication requires men with ability . . . and plant capacity. Moloney has both, and for you it means transformers that are dependable . . . because they're properly designed and skillfully fabricated to provide better overall operating performance.

M655-55

Specify Moloney . . . Get Dependability at its Best . . . All Along the Line

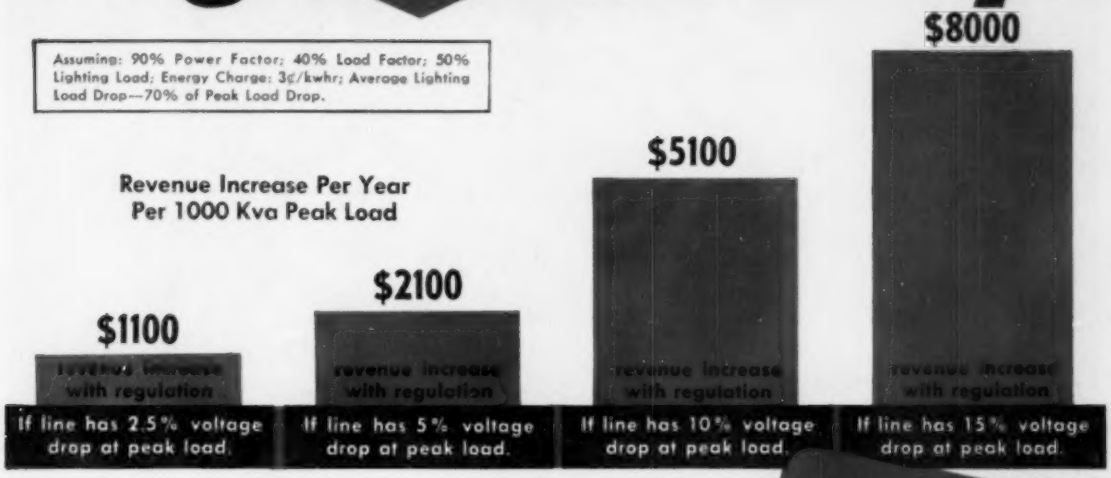
MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

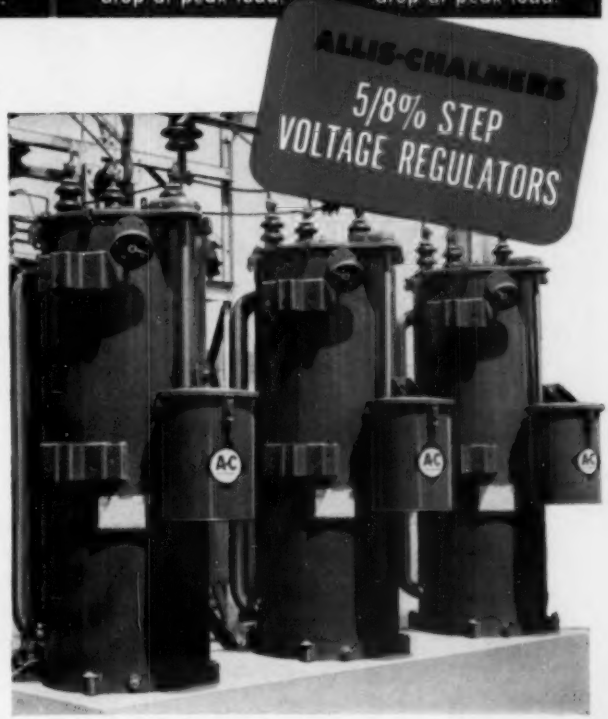
These Figures Prove
Regulation Pays

Assuming: 90% Power Factor; 40% Load Factor; 50% Lighting Load; Energy Charge: 3¢/kwhr; Average Lighting Load Drop—70% of Peak Load Drop.


Revenue Increase Per Year
Per 1000 Kva Peak Load
$1100
revenue increase with regulation
If line has 2.5% voltage drop at peak load.
$2100
revenue increase with regulation
If line has 5% voltage drop at peak load.
$5100
revenue increase with regulation
If line has 10% voltage drop at peak load.
$8000
revenue increase with regulation
If line has 15% voltage drop at peak load.

You can increase revenue $2100 the first year with an Allis-Chalmers distribution regulator. That's on a line with only 5% low voltage at peak loads. This increase is more than the regulator costs. Taking all cost factors into consideration, it's enough to pay back initial investment in two years or less, in most cases.

You improve your maintenance picture too, with Allis-Chalmers distribution regulators. Since complaints due to low voltage will be greatly reduced (some operators report them eliminated!), service crews and equipment can be used where they are really needed. No more time and money wasted testing voltage at customers' homes.



Low Maintenance, Long Life

Hundreds of distribution engineers will tell you that when you specify Allis-Chalmers voltage regulators you get a unit that requires minimum maintenance, gives longest possible life. For example, the mechanism is laboratory tested to withstand 5 million operations. More than 20 years of field operation have added operating proof to these tests. No other 5/8% step regulator offers successful service records like these.

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ALLIS-CHALMERS